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Risk factors and indicators for engagement in violent extremism

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Student Declaration

I, Caitlin Siobahn Clemmow, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Date: 08/06/2020

Acknowledgements

This thesis is my own work and has not been submitted in the same form for the award of a higher degree at any other institution. Early versions of certain aspects of this thesis were published, or submitted for publication in the following periodicals:

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Abstract

Research on terrorism is increasingly empirical and a number of significant advancements have been made. One such evolution is the emergent understanding of risk factors and indicators for engagement in violent extremism. Beyond contributing to academic knowledge, this has important real-world implications. Notably, the development of terrorism risk assessment tools, as well as behavioural threat assessment in counterterrorism. This thesis makes a unique contribution to the literature in two key ways. First, there is a general consensus that no single, stable profile of a terrorist exists. Relying on profiles of static risk factors to inform judgements of risk and/or threat may therefore be problematic, particularly given the observed multi- and equi-finality. One way forward may be to identify *configurations* of risk factors and tie these to the theorised causal mechanisms they speak to. Second, there has been little attempt to measure the prevalence of potential risk factors for violent extremism in a general population, i.e. base rates. Establishing general population base rates will help develop more scientifically rigorous putative risk factors, increase transparency in the provision of evidence, minimise potential bias in decision-making, improve risk communication, and allow for risk assessments based on Bayesian principles. This thesis consists of four empirical chapters. First, I inductively disaggregate dynamic person-exposure patterns (PEPs) of risk factors in 125 cases of lone-actor terrorism. Further analysis articulates four configurations of individual-level susceptibilities which interact differentially with situational, and exposure factors. The PEP typology ties patterns of risk factors to theorised causal mechanisms specified by a previously designed Risk Analysis Framework (RAF). This may be more stable grounds for risk assessment however than relying on the presence or absence of single factors. However, with no knowledge of base rates, the *relevance* of seemingly pertinent risk factors remains unclear. However, *how* to develop base rates is of equal concern. Hence, second, I develop the Base Rate Survey and compare two survey questioning designs, direct questioning and the Unmatched Count Technique (UCT). Under the conditions described, direct questioning yields the most appropriate estimates. Third, I compare the base rates generated via direct questioning to those observed across a sample of lone-actor terrorists. Lone-actor terrorists demonstrated more propensity, situational, and exposure risk factors, suggesting these offenders may differ from the general population in measurable ways. Finally, moving beyond examining the prevalence rates of single factors, I collect a second sample in order to model the relations among these risk factors as a complex, dynamic system. To do so, the Base Rate Survey: UK is distributed to a representative sample of 1,500 participants from the UK. I introduce psychometric network modelling to terrorism studies which visualises the interactions among risk factors as a complex system via network graphs.

Impact Statement

This thesis synthesises and builds upon a foundation of existing knowledge to contribute towards our increasingly developing understanding of risk factors and indicators for engagement in violent extremism. This knowledge informs the practice of risk and threat assessment, globally. The present findings address two key gaps identified in the literature. First, I present evidence for considering the compounding and cumulative effect of *configurations* of risk factors to better inform judgements of risk. Specifically, this knowledge could provide a framework for intelligence and security services gathering intel, as well as for practitioners drawing up case formulations. Second, I generate base rates estimates of over 100 correlates of extremism, as well as providing evidence for *how* to develop base rates. Both the estimates and the full survey are openly available to others on the Open Science Framework (OSF) to facilitate and encourage future research, as well as for the information of relevant practitioners. The findings provide further empirical evidence upon which to draw for those conducting terrorist risk and threat assessment.

The work detailed here has been disseminated widely over the last three years including presentations at national and international conferences, to policy-relevant bodies such as the Home Office, and to practitioners. Most of the empirical work presented here has been published in leading terrorism, criminology, and forensic science journals. The remaining unpublished work is currently under review. I have been afforded opportunities to engage with practitioners throughout my PhD, to whom I have disseminated my findings. I have presented this thesis in full to the Home Office and findings have been distributed to the FBI's Behavioural Science Unit, both London's and Queensland's Fixated Threat Assessment units, and the Department of Homeland Security.

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In 2008, a review of terrorism research noted a new book on terrorism was published every six hours (Silke, 2008). This wave of interest contrasts to the pre-9/11 era, which mostly garnered sporadic attention from scholars of more established disciplines. In the aftermath of 9/11, terrorism studies emerged arguably as a discipline of its own. Despite a burgeoning academic interest, reviews of the literature consistently highlight similar problems (Crenshaw, 1992; Horgan, 1997; Sageman, 2014; Schmid, 2004; Schuurman, 2018; Schuurman & Eijkman, 2013; Silke, 2001; 2004; 2008; Spaaij & Hamm, 2015). Silke (2001) describes the 'levels' of research an academic field progresses through; *exploratory, descriptive,* and *explanatory* (see Robson & McCartan, 2016). First, the exploratory level defines broader conceptual issues. Methodologies at this stage are largely qualitative as researchers establish the 'big picture.' Second, the descriptive level establishes more granular detail through increasingly empirical analysis. Finally, the explanatory level seeks to reliably validate these findings and predict future behaviour with robust quantitative, often multivariate, methodologies.

Over 15 years ago, Silke (2001) argued that terrorism research had failed to progress to the final stage, as evidenced by a failure to successfully predict outcomes and prolonged conceptual issues. However, progress is evident (Schuurman, 2018). Greater access to data spawned an empirical evolution in response to many of the noted limitations. The field progressed towards the descriptive stage and introduced a range of important findings with significant practical implications. Notably, research has sought to establish the prevalence of risk factors and indicators associated with engagement in violent extremism in a range of group and lone-actor terrorists. This, in part, sparked the development of a number of terrorism risk assessment tools, and informs both threat and risk assessment, globally. However, a number of challenges persist.

It is important to consider the principles of equifinality and multifinality and how these apply to our understanding of the terrorist (Gill, Farnham & Clemmow, in press; Corner, Bouhana, & Gill, 2019). There is no stable, general profile of a terrorist. A common 'profile' of risk factors may result in different outcomes, in different people; this is multifinality. Equifinality conversely describes the diversity of pathways which lead to similar outcomes. Therefore, relying on the presence or absence of static risk factors to inform risk or threat judgements may be problematic. Violent extremism is likely the outcome of a complex mix of personal and social factors which converge in time and space (Horgan, 2014; Gill, 2015a). Configurations of risk factors which speak to the underlying causal process driving the phenomenon may be more stable grounds for risk assessment. However, practically, risk assessment necessitates the measurement of observable behaviours or indicators. The causal mechanisms that underpin how some come to pursue violent extremism can be difficult to measure. Articulating *patterns* of risk factors and tying these to analytically coherent causal mechanisms may be one way to provide an insight into the causes of the causes of violent extremism, whilst conserving the benefits of being objectively observable.

However, the extent to which many of these factors occur in the general population remains unknown. Hence the *relevance* of risk factors found to be prevalent in offending samples is yet to be specified. In other words, we do not know if risk factors identified in offending samples reliably differentiate between a 'normal' population and a vulnerable population. This drives the need to develop base rates. Establishing base rates will help develop more scientifically rigorous putative risk factors, increase transparency in the provision of evidence, minimise potential bias in decision-making, improve risk communication, and allow for risk assessments based on Bayesian principles. This thesis seeks to address these gaps in the literature in two main ways: by disaggregating *configurations* of risk factors and indicators associated with violent extremism in both

offending and general population samples, and by contributing towards developing general population base rate estimates of relevant risk indicators.

1.1 Chapter outline

Chapter 2 reviews the evolution of terrorism studies and how the field has progressed through the exploratory, descriptive, and on towards the explanatory level of research. The chapter considers the development of exploratory-level typologies, descriptive-level behavioural profiles, and concludes by reviewing explanatory-level conceptual models and the empirical evidence for these thus far. A number of gaps in the literature are identified which provide the foundation for the following four empirical chapters.

Chapter 3 presents the results of applying inductive pattern-detection, drawing on a previously designed Risk Analysis Framework (RAF) (Bouhana, 2019), to a dataset of 125 lone-actor terrorists. I present dynamic configurations of risk factors and tie these to theorised causal mechanisms to move beyond profiles of static indicators. The results demonstrate how interacting patterns of factors, conceptualised as person-exposure patterns (PEPs), underpin trajectories to lone-actor violence. The implications of these findings for the threat assessment and management of these types of terrorists are discussed. However, a notable limitation is the lack of understanding of base rates.

Chapter 4 and 5 focus on developing general population base rate estimates of risk factors and indicators associated with engagement in violent extremism. Initially, *how* to develop base rates is considered. Self-reporting sensitive attitudes or behaviours is often subject to biases which make it difficult to establish reliable prevalence estimates. I develop the Base Rate Survey based on a codebook collated from the wider literature (Gill, Horgan & Deckert, 2014) and distribute it to a Western population via an online access panel, Prolific. I compare two questioning designs; indirect (the Unmatched Count Technique) and direct. The

results suggest that, under the present study conditions, direct questioning yields the most appropriate estimates. This has implications not only for terrorism studies and our understanding of base rates, but for future research utilising online panels (such as Prolific) or studies collecting sensitive self-reports in general.

Chapter 5 employs the general population base rate estimates from chapter 4 in a direct comparison with an offending sample of lone-actor terrorists. In general, there are measurable differences evident. Lone-actor terrorists were more likely to demonstrate propensity and situational indicators that suggest individual-level susceptibilities which may make a person more vulnerable to extremism. Lone-actor terrorists were also more likely to demonstrate exposure indicators. Lastly, lone-actor terrorists demonstrated more propensity, situational, and exposure indicators overall, suggesting that understanding the compounding effect of *interactions* of risk factors may be key to understanding the emergence of violence risk.

Chapter 6 explores these interactions by applying psychometric network modelling to visualise the theorised components of risk (propensity, situation, and exposure) as a network of dynamic associations. To do so, data from a second general population sample is collected. This is for two main reasons: 1) in order to gather a representative sample of the UK population, 2) to gather a larger sample more suited to the proposed analytical strategy. I suggest psychometric network modelling from the parallel field of psychology is an analytical strategy capable of modelling the complexity of engagement in terrorism. The results visualise the interactions among risk factors as network graphs and I present a series of pathways to exposure.

Chapter 7 concludes by drawing together the main findings and discussing some general limitations to bear in mind when considering the practical implications of this thesis.

I outline considerations for future research to contribute towards the continuing development of our understanding of terrorism.

2.1 Introduction

This chapter reviews the progression of research on terrorism, through the exploratory, descriptive, and explanatory levels of research. First, exploratory-level research predominantly presents broad ways to conceptualise terrorists. These are most often typologies. For the purposes of this review, I focus on typologies of terrorists (as in offenders), not terrorism (as in the action). Typologies consider sub-types of an offender population that are differentiated upon single or multiple facets of offending behaviour. These are predominantly qualitative, based on case studies or theory, and reflect early attempts to organise large amounts of information. Typologies are a way to "bring order to this chaos" (Mehari, 1978; 331) and are a key feature of the exploratory stage of any field. This section situates the limitations of these within the context of wider issues affecting terrorism research.

Second, this review considers the move towards more empirical analyses and examines research which has propelled the field towards the descriptive level; this consists largely of behavioural profiles. Behavioural profiles present empirically-derived, behaviour-based characteristics of an offending group. Much of this consists of rich, granular analysis of offending behaviour, as researchers moved towards establishing the prevalence of risk factors and indicators for engagement in violent extremism in a range of terrorist-offending populations. Lastly, this chapter considers research contributing towards the explanatory level of research. Much of this work applies a process-perspective to developing an understanding of *how* some come to pursue violent extremism, and as such, moves beyond profiles of prevalence rates of indicators.

2.2 Typologies of terrorists

Typologies are a useful way for researchers to categorise heterogenous populations. As research interest in terrorism grew, a number of typologies emerged. Table 1 summarises typologies of terrorists by comparing the actors they classify, detailing their types, the traits they differentiate upon, and how the types were constructed. In terms of scope, the present review focusses only on typologies of terrorists, as in *types of people*, rather than types of terrorism, or types of terrorist groups. Previous reviews of the literature consider typologies of terrorism (Flemming, Stohl, & Schmid, 1988; Marsden & Schmid, 2011). Whilst typologies of terrorists largely formed the foundations of terrorism studies, there are limitations. First, typologies of terrorists largely lack any significant empiricism and consist predominantly of ideal types. Second, many are deductive and perhaps reductionist, as they are defined by inferred dimensions that are applied retroactively to a set of cases. Lastly, there is a lack of theoretically-grounded empiricism, and so the practical utility of many of these typologies may be limited. The sub-sections that follow elaborate upon each limitation in turn.

2.2.1 Ideal types and a lack of empiricism

Ideal types are based on researcher-led inferences or theorising and do not exist in reality. Empirical types are derived from statistical analysis of behavioural patterns that can be observed in the real world (Blackburn, 1993; Helfgott, 2008; Kuckartz, 2016). Ideal types are a way to classify and compare theoretical sub-types and serve an important purpose in social research. However, the lack of empiricism evident in Table 2.1 is perhaps reflective of wider methodological issues in terrorism research in general. A lack of statistical testing is an issue acknowledged throughout the study of the terrorist (Crenshaw, 1992; Roberts, 2015; Silke, 2001; 2004; 2008), most likely due to the rarity of these events, and consistent issues with access to data.

Reviews of the state of terrorism research report that few studies employ descriptive statistics, and even fewer make use of inferential statistics. Between 1995 and 1999, 3% of terrorism studies used inferential statistics compared to 86% in forensic psychology and 60% in criminology (Silke, 2001). However, progress is evident. In a review of research published on terrorism in specialist journals, Schuurman (2018) found an increase in the use of statistics from 17% in 2007 to 28% in 2016. Of those, 15% used descriptive statistics, 6% used both descriptive and inferential statistics, and 1% used only inferential statistics. Improvement is marked however there remains evidence of a lack of empiricism, particularly when considering the methodological advances in analogous fields, such as criminology, or psychology. This can be seen in Table 2.1, where typologies of terrorists are largely theorised.

Table 2.1. Typologies of terrorists

Author	Actors	Types	Traits	Types constructed from	Statistical analysis
Bates (2012)	Lone-actor terrorists	Lone wolf avenger, lone wolf vigilante, lone wolf revenger, lone wolf guerrilla, lone wolf guided missile	Radicalisation, motivation, form, risk-awareness	Dimensions of lone-actor offending & case studies	No
Crone & Harrow (2011)	Homegrown terrorists in the West	Internal autonomous, external autonomous, internal affiliated, external affiliated	Belonging & autonomy	Dimensions derived from debate around 'homegrown' terrorists as a distinct type	Belonging & autonomy operationalised with proxies. Descriptive statistics show change over time (1993 – 2008)
Gill (2015a)	Lone-actor terrorists	Relying on others support, struggling isolation, functioning in a virtual network, preparing for the attack	45 behavioural characteristics	Pattern analysis of observed behaviours	Yes – Multidimensional scaling (MDS)
Hacker & Hacker (1976)	Terrorists	Crazies, crusaders, criminals	Individual differences	Researcher inference	No
Holt et al. (2019)	Terrorists	Loners, colleagues, peers, teams, formal organisations	Relational ties (social organisation framework)	Best & Luckenbill's (1994) framework,	No (qualitative analysis)

				qualitative case study analysis (n = 4)	
Horgan et al. (2018)	Terrorists	Actors, supporters, facilitators	Organisational roles	Pattern analysis of observed behaviours	Yes – Multidimensional scaling (MDS)
Kimhi & Even (2004)	Palestinian suicide terrorists	Religious, fanatic, exploited avenger, nationalist fanatic	Motivation	Content analysis of open source material of 69 suicide bombers	No
Lankford (2014)	Suicide terrorists	Conventional, coerced, escapist, indirect	Suicidal motivation	Suicide-based theory & case studies	No
Miller (2006)	Terrorist group members	Leaders (narcissistic & paranoid personalities), true believers (borderline & antisocial personalities), worker bees (avoidant & dependent personalities), limelight seekers (histrionic & schizoid-schizotypal personalities)	Personality disorders & terrorist group role	Researcher inference	No
Nesser (2006)	Terrorist group members	Entrepreneur, his protégé, misfits & drifters	Individual characteristics	Survey of al-Qaeda terrorist cells	No
Pantucci (2011)	Islamist lone-actor terrorists	Loner, lone wolf, lone wolf pack, lone attackers	Social connectedness	Case studies	No
Phillips & Pohl (2012)	Lone-actor terrorists	Risk-averse lone wolf, risk-seeking lone wolf	Risk seeking	Economic risk theory	No

Post et al. (2014)	Lone-actor terrorists	Glory-seekers, hero worshippers, lonely romantics, radical altruists	Motivation	Behavioural Analysis of 43 lone-actors (open source)	No
Ravndal (2015)	Right-wing terrorism & violence in W. Europe	Elite-sponsored groups, autonomous groups, lone-actors, right-wing crime syndicates, mobs, gangs & hooligans, violent loners	Political strategy, organisation	Matrix cross-tabulation	No
Simon (2013)	Lone-'wolf' terrorists	Secular lone-wolf, religious lone-wolf, single-issue lone-wolf, criminal lone-wolf, idiosyncratic lone-wolf	Motivation	Research inference	No
Smith et al. (2015)	Lone-'wolf' terrorists	Loners, affiliated loners, lone conspirators, cells/groups	Participatory typology base on three elements: 1) was the person affiliated with a group/movement, 2) did the individual have hep committing any of the precursors behaviours, 3) did the person have help committing the planned or completed incident	Research inference	No
Spencer (2016)	Female ISIS members	Domestic, wife, mother, operational, al-khansaa brigade, recruiters, state-builders, skilled workers, students	Role in ISIS	Research inference	No

| Strentz (1988) | Terrorist group members | Leader, activist operator, idealist | Individual differences and organisational role | Analysis of American & international terrorist organisations (60's-70's) | No |

Ideal types are characteristic of the exploratory level of research, where researchers define conceptual tools to establish order in a new field. Exploratory typologies organise large amounts of information into manageable constructs for research and comparison (Ravndal, 2015). For example, Miller (2006) developed a typology of terrorist group members based on the psychological attributes of personality disorders in psychopathology. The typology elaborates different types of terrorist group members based on the features of 8 personality disorders; *narcissistic*, *paranoid*, *borderline*, *antisocial*, *avoidant*, *dependent*, *histrionic,* and *schizoid-schizotypal personality disorder*. Features of each personality disorder are used to theorise how certain traits might be expressed as behaviours in terrorist group activity. These are ideal types as these features are theorised to reflect characteristics of different terrorist group members and serve as a tool for conceptually organising group members.

Nesser (2006) proposed a tentative typology of the structures of jihadist terrorist cells in the UK and Europe. The types are based on qualitative analysis of interviews with jihadi terrorists and include *an entrepreneur, his protégé, misfits,* and *drifters*. This typology is not presented as an exhaustive categorisation of jihadist terrorist cells, rather as an exploratory-level conceptualisation of a heterogeneous offending group based on primary source, qualitative data. In fact, most of the typologies in Table 2.1 consist of ideal types (Bates, 2012; Crone & Harrow, 2011; Hacker & Hacker, 1976; Holt et al., 2019; Kimhi & Even, 2004; Lankford, 2014; Miller, 2006; Nesser, 2006; Pantucci, 2011; Phillips & Pohl, 2012; Post et al., 2014; Ravndal, 2015; Simon, 2013; Spencer, 2016; Strentz, 1988).

These typologies have been constructed in order to manage the heterogeneity of the offending population for the purposes of exploratory-level research and comparison. The alternative is empirical typologies that are constructed scientifically on the basis of applied statistical analysis of real-world data. There are few examples of scientifically constructed

typologies in Table 2.1, where "[S]scientific typology construction is a systematic activity that differs from everyday classifications that tend to be based on stereotypes and observational errors" (Helfgott, 2008; 27). In order to progress beyond the exploratory level of research, explanatory typologies that aim to identify causal mechanisms in pathways to terrorist violence may be useful (Ravndal, 2015).

To develop such typologies, a systematic approach to constructing types, whether ideal or empirical, is needed. For instance, Pantucci (2011) posits a four-category typology of Islamist lone-actor terrorists. No information is provided about *how* these types were constructed. The four types are *loner, lone wolf, lone wolf pack,* and *lone attacker,* where offenders are differentiated in terms of their degree of connectedness to extremist Islamist individuals or organisations. The *loner* acts in isolation of any group or wider movement. These individuals may be suffering from psychological or social issues. The *lone wolf* is also a solo terrorist but differs in the nature of their social ties to Islamist-inspired groups. They act alone but with clear connections or command-and-control links to Al-Qaeda. Third, the *lone wolf pack* is a group of *lone wolves* who have self-radicalised via the Al-Qaeda narrative. This group are distinguished from established extremist groups as they have yet to make contact or commitment to an organised terror network. Finally, the *lone attackers* are a radicalised group with clear command-and-control links to Al-Qaeda or affiliated groups. These offenders are described as 'one-man terror cells' and are conceptually distinct from the idea of a lone attacker. Yet, *how* these types were derived is unclear. Therefore, it may be reasonable to assume that these categories are based on inferences from the literature or researcher conjecture. Whilst useful for the purposes of organising information and conceptualising heterogeneity, the practical utility of such of an assessment, for instance in terms of threat assessment, is understandably limited.

In contrast, Ravndal (2015) systematically constructed a typology of right-wing

terrorism and violence in Western Europe. The typology draws on the social sciences, evaluating an existing typology of right-wing terrorism against a standard for typology development established in political science by Collier, LaPorte, and Seawright (2012). After a process of frequency analysis and cross-tabulation, he proposed a typology organised by degrees of organisation (ties to wider networks) and political strategy. These are *elite-sponsored groups, crime syndicates, autonomous cells, gangs, lone-actors,* and *violent loners.* Ravndal (2015) clearly defines the concept of the typology, specifies that it is exploratory, describes in detail how the types are constructed, proposes an intuitive model, and then refines this model to present a simpler solution. This demonstrates a systematic approach to constructing types. The purpose of this categorisation is to provide a tool for organising information about right-wing violence and hence, although systematic, again consists of ideal types and lacks statistical empiricism.

However, Table 2.1 identifies two typologies that are scientifically derived and consist of empirical types, (Gill, 2015a; Horgan, Shortland, & Abbasciano, 2018). Both used multidimensional scaling (MDS) techniques to disaggregate terrorist behaviour and present an empirical typology of different types of terrorists. Drawing on methodologies from investigative psychology, the authors used MDS to explore patterns of behaviour. MDS computes graphical representations of the associations between variables in a dataset, in a space of pre-defined dimensions. Data is represented as points in space where points that appear close to one another can be inferred as more related than points that appear far away from one another. Clusters of points can be interpreted as themes or categories.

Gill (2015a) analysed 45 behavioural characteristics of 111 lone-actor terrorists using smallest space analysis (SSA), an MDS technique. The analysis identified four distinct clusters that were interpreted as a 'styles of offending.' First, *relying on other's support* summarises a cluster of behaviours related to the planning and execution of a terrorist attack

with clear command-and-control links. Second, *struggling isolation* refers to a cluster of behaviours that may be linked to problematic personality disorders. Third, *functioning in a virtual network* characterises behaviours indicative of being free from personal constraints. Lastly, *preparing for the attack* includes behaviours that may condition a person towards violence. These findings demonstrate a novel way of conceptualising terrorist behaviour by systematically and empirically detecting patterns naturally embedded within the data.

Similarly, Horgan et al. (2018) detected three patterns of behaviour in their sample of 183 convicted US terrorists which they termed *actors, supporters,* and *facilitators*. The authors assigned subjects to one of three types on the basis of observed behaviours. A fourth hybrid type was computed where some cases were not exclusively defined by one of the MDS types. This allowed for comparisons of the demographic characteristics between themes. The authors reported significant differences between types across variables such as age, citizenship, ideology, and criminality.

Again, this approach to typology construction illustrates a systematic and scientific method for developing an empirical typology. In comparison to Pantucci's (2011) typology of lone-actors, Gill (2015a) and Horgan et al. (2018) used multivariate statistical techniques to detect differences between terrorist group members based on tangible, observed behaviours. The practical applications of such findings may be greater than those derived from ideal types. This comparison also highlights a further limitation of typologies of terrorists, as can be seen in Table 1. Most typologies of terrorists are unidimensional and deductive, as they are differentiated upon single, researcher-defined dimensions. Where Gill (2015a) and Horgan et al. (2018) have derived the facets of their typology from multivariate analysis of *patterns* of behaviour, Pantucci's (2011) types are differentiated upon by two researcher-defined dimensions that most likely do not reflect the complexity of lone-actor terrorism.

2.2.2 Deductive and unidimensional types

Most typologies of terrorists disaggregate types by one or two behaviours or researcher-defined dimensions. For instance, Post et al. (2014) differentiates among lone-actor terrorists, categorically, by motivation. Phillips and Pohl (2012) similarly propose a categorical typology of lone-actor terrorists based on their risk-seeking preferences, where Spencer (2016) elaborates a categorical typology of female ISIS members based on their role in ISIS. Individual characteristics, motivation, social connectedness, belonging and autonomy, personality differences, suicidal motivation and radicalisation, are all posited as traits to differentiate a number of terrorist actors including terrorist groups, suicide terrorists, and lone-actors, (Crone & Harrow, 2011; Hacker & Hacker, 1976; Kimhi & Even, 2004; Lankford, 2014; Miller, 2006; Nesser, 2006; Pantucci, 2011).

Such dimensions are largely researcher-defined and retroactively applied to a set of cases (with exceptions being Gill, 2015a and Horgan et al., 2018). Deducing these dimensions is often based on detailed analysis of case studies, inferences drawn from established theory, or previous empirical findings. For instance, Smith et al. (2015) outline a participatory typology of lone-'wolf' terrorists based upon previous research (Pantucci, 2011; Borum et al., 2012; Gruenewald et al., 2013). Strentz (1988) defines dimensions based upon a review of cases of American and international terrorist organisations during the 60's and 70's. Post et al. (2014) review open source documents pertaining to 43 cases of lone-actor terrorism to deduce their types. However, disaggregating terrorists this way may apply researcher-led assumptions upon the data and thus mask patterns of behaviour that occur naturally. It is also likely that such complex offending populations cannot be reduced to a single, dichotomous facet of behaviour.

In reality, terrorist behaviour does not conform to absolute categories. A more pragmatic advance may be to pursue a *multidimensional* approach. Bates (2012) proposes a

five-category typology of lone-actor terrorists based on a general model of lone-actor behaviour. The model considers degrees of variability along four dimensions; *radicalisation, chaos/career, motivation,* and *degree of risk acceptability*. It describes a spectrum along each dimension, where *motivation* for example is a scale from *egoistic* to *altruistic*. Given its dimensionality, the model can describe a range of offenders, however Bates (2012) presents five common profiles of lone-actor terrorists in detail; *the lone wolf avenger, the lone wolf vigilante, the lone wolf revenger, the lone wolf guerrilla,* and *the lone wolf guided missile.*

The *lone wolf avenger* is exemplified by lone-actor terrorists such as Ted Kaczynski who is described as "personally self-radicalised, egoistic, serial, and risk aversive." The second type, the *lone wolf vigilante* is a "self-radicalised, egoistic, risk-seeking, career terrorist who pursues a series of personal confrontations." Third, the *lone wolf revenger* presents similarly to the *lone wolf vigilante*, except is characterised as 'chaos creating' rather than a career terrorist. Fourth, the *lone wolf guerrilla* is not considered self-radicalised due to previous indoctrination through some sort of training and is described as risk averse. Risk aversion materialises as an offender who pursues terroristic goals over a longer period of time. Finally, the *lone wolf guided missile* is characterised by offenders whose radicalisation is facilitated through social ties to other extremists, motivated altruistically by their ideology, risk-seeking, and chaos creating. An example of this type of offender is a suicide bomber. By considering multiple facets of terrorist behaviour, the multidimensional typology can account for some of the variation that exists among lone-actor terrorists.

Multidimensional typologies demonstrate another way to conceptualise terrorist behaviour. Yet many of these remain deductive and are exploratory. This is to be expected as the purpose of much of this work is again, "to bring order to this chaos" (Merari, 1978; 331). However, there is little in Table 2.1 that explains the *causes* of terrorist behaviour, most likely as this was not the purpose of these conceptualisations. However, to do so, it is

necessary to employ a robust theoretical framework and empirically operationalise constructs to begin to establish causality. "It is only, when empirical analyses are combined with theoretical knowledge, that 'empirically grounded types' can be constructed" (Kluge, 2000; 3). Theoretically grounded empirical types enable researchers to make statements about *how* some people come to pursue terrorism, rather than simply describing the differences between them.

2.2.3 Theoretically grounded empiricism

The application of theory in terrorism research has been described as fragmented, (Borum, 2011; King & Taylor, 2011). This again can be seen in Table 2.1. Theory is essential in any discipline to provide a framework for research and ground empiricism in established reasoning. Empiricism alone cannot establish causality. Moreover, for prevention and intervention strategies to be effective, it is necessary to have some understanding of the causal mechanisms that underpin any phenomenon, (Bouhana & Wikström, 2010). The lack of applied theory in Table 2.1 is likely symptomatic of wider issues surrounding the application of theory in terrorism studies, in general. In order to move towards explanatory accounts of terrorist behaviour, a robust theoretical framework is necessary.

As terrorism has drawn interest from a number of disciplines, there is understandably no widely accepted 'theory of terrorism' (Crenshaw, 1981). However, the field's approach to theory has been described as problematic. In a survey of academics, 43 out of 83 respondents replied to the question 'What theory to use in the study of terrorism?' stating that they use their own theory. A further 38 responded citing theoretical approaches such as 'Walter Lacquer's historical analysis,' 'Bruce Hoffman's ideas on New Terrorism,' 'David Rapoport's 'four waves' theory,' alongside more. Some referred to the use of established social science theory in terrorism research, such as 'Della Porta's use of social movement

theory,' where others referred to ideas such as 'Silke's ideas on the psychology of terrorism (Schmid, 2011). This speaks to a discord about what actually constitutes theory in terrorism research.

Theories such as constructivism, critical theory, democratic peace theory, group-based theories or concepts such as polarisation and groupthink, just war theory, social movement theory, and more, have been applied to the study of terrorism (Pisoiu & Hain, 2017). Researchers too suggest drawing on more established criminological perspectives and applying them to the problem of terrorism, including approaches such as subcultural theory, rational choice theory, social disorganisation, and routine activity theory, amongst others (Freilich & LaFree, 2017).

Some conceptualisations of terrorists in Table 2.1 draw on theory to elaborate explanations of terrorist behaviour. For example, Phillips and Pohl (2012) propose a typology of lone-actor terrorists based in economics and offender profiling in investigative psychology. The typology proposes a two-type profile of lone-actors embedded in rational choice and expected utility theory. Offenders are differentiated by their degree of risk aversion in a two-type profile constructed from the mathematical modelling of lone-actor behaviour; the *risk-averse* and the *risk-seeking lone-actor*. The *risk-averse lone-actor* spends less time engaged in illegitimate activities and may engage in terrorist acts if the opportunity and expected returns exceed that of alternative legitimate options. Influences such as law-enforcement may alter the expected returns and thus deter the risk-averse lone-actor terrorist. The *risk-seeking lone-actor* will engage in terrorist activity where the expected marginal returns are greater than that of legitimate activities. These offenders may spend more time committed to terrorism and as risk increases from law enforcement, may in fact increase their criminal activities.

Expected utility theory and the concept of economic risk allows the researchers to make predictive statements about how each type of actor might behave. Similarly, Lankford (2014; 80) details a four-category typology of suicide terrorists informed by a theory of suicide, describing the types as:

"1) conventional suicide terrorists who become suicidal owing to classic risk factors, 2) coerced suicide terrorists who become suicidal because they fear the organizational consequences of not carrying out attacks, 3) escapist suicide terrorists, who become suicidal because they fear being captured by the enemy and 4) indirect suicide terrorists, who become suicidal at an unconscious level and orchestrate their deaths in ways that disguise their desire to die."

The application of theory infers predictions about expected behaviour at critical points in different offenders' paths to suicide terrorism. The typology makes predictions about warning signs, tactical experience, and attack styles for all four of its types. For example, in attack styles, Lankford (2014) details how the four types of suicide bombers are likely to attack based on the nature of their suicidality. *Conventional* and *escapist suicide terrorists* are those who most want to die. In theorising their suicidal tendencies, the typology can draw inferences about causality and make predictions about future behaviour.

These examples demonstrate the utility of employing theory. However, neither demonstrate the theoretically grounded empiricism that is wanting. This echoes the sentiments of reviews of the empirical support for mechanisms of political radicalisation (Bouhana & Wikström, 2011; Gøtzsche-Astrup, 2018). First, Bouhana and Wikström (2011) undertook a rapid evidence assessment of research on the causes of Al-Qaeda-influenced radicalisation (AQIR) and found the evidence-base to be weak, where empirical research was exploratory. Specifically, they identified evidence for a number of individual-risk factors for AQIR, but a limited understanding of the casual processes that lead to AQIR, and

radicalisation in general. An exacerbating issue was the lack of a framework capable of bringing together multi-level explanations of AQIR. Bouhana and Wikström (2011) present evidence for the foundations of a knowledge-base but conclude that without a robust theoretical framework, research on AQIR, and radicalisation more generally, fails to advance to the explanatory level.

More recently, Gøtzsche-Astrup (2018) evaluated empirical evidence for mechanisms of political radicalisation in terrorism research. The purpose of the study was to highlight the need to validate theoretical constructs, empirically, in order to inform more effective interventions. To be included for review, articles had to originate from a theoretical framework for understanding radicalisation, be empirically based, and expound individual-level psychological factors. Six theoretical approaches survived their inclusion criteria; uncertainty-identity theory (Hogg & Adelman, 2013), significance quest theory (Webber & Kruglanski, 2018), the devoted actor model (Atran, 2016), mindset and worldview theory (Borum, 2014), reactive approach motivation (McGregor, Hayes, & Prentice, 2015) and the two-pyramid approach (McCauley & Moskalenko, 2008).

Evaluating these, strong evidence was found for normal psychological mechanisms (rather than psychopathology), motivational processes (rather than calculations of risk and reward), negative life experiences, fundamental uncertainty or loss of meaning, shift in social identity towards a single social group, small group dynamics, and heightened dispositional anxiety, aggression, and impulsivity. Moderate evidence was found for an authoritarian, dogmatic and fundamentalist mindset, and negative emotions, particularly anger. Further research was deemed necessary for the causal role of ideology, individual differences, and the role of relative uncertainty, significance, and sacred values. These findings demonstrate that despite a fragmented approach to theory, there is empirical support for some key mechanisms of political radicalisation. In general, whilst external validity has improved, the internal

validity of studies remains poor. Internal validity is necessary to make causal claims and hence the review advocates for greater theoretically grounded empiricism in order to advance research to the explanatory level.

In sum, Table 2.1 epitomises the exploratory stage of terrorism research. These typologies are constructs to define broad categories for comparison, based on small samples, case studies, or inference, and are the essential foundations of any emerging field. However, Table 2.1 highlights some limitations of exploratory-level research. Notably, a lack of empiricism, reductionism, unidimensionality, and an inconsistent application of theory. In pursuit of greater empiricism, behavioural profiles embody the fields progression to the descriptive level of research. The following section reviews the emergence of statistically derived profiles of terrorists, typical of this level of research.

2.3 Behavioural profiles

Behavioural profiles present statistically derived profiles of offenders in a uniquely empirical conceptualisation of the terrorist. Such analyses provided a novel insight into terrorist behaviour amidst a relative vacuum of empiricism. However, behavioural profiles predominantly consist of prevalence rates. Such profiles may be limited in the extent to which they can explain the causes of terrorism, particularly given their multifinality (Corner, et al., 2019).

Another key problem with much of this research is that only those who are radicalised or those who engage in violent extremism are sampled and studied. So, whilst some factors have been found to be highly prevalent in some violent extremist samples, it is unclear whether this finding is unique to violent extremists, or whether they occur less, just as much, or more so in the population of non-extremists. This has a range of implications for the social

scientific study of the causes of violent extremism and the practical assessment of potential violent extremism. This drives the need for the development of base rates.

This section reviews the evidence for individual risk factors for terrorism. Taking a broader look at the literature, some key limitations of behavioural profiles are identified. Often behavioural profiles fail to account for the heterogeneity of terrorism and present aggregated profiles of the 'average' terrorist. Some profiles do disaggregate offending populations, however do so deductively, led by researcher-inference. Equally, many rely overly on descriptive statistics, which cannot speak to causality. As an alternative to deductive reasoning, some demonstrate behavioural clustering as a novel approach to conceptualising heterogenous offending behaviour. Table 2.2 summarises behavioural profiles of terrorists, including the populations they are based on, data source, the statistics they employ, and the characteristics they examine.

Table 2.2 Behavioural profiles of terrorists

Author	Sample	Data Source	Type of Statistics	Disaggregated	Characteristics
Altunbas & Thornton (2011)	77 homegrown Islamic terrorists (UK) 2001-2009 vs 1363 UK Muslims	Gartenstein-Ross & Grossman (2009) & secondary sources (statistics on UK Muslims from British Crime Survey)	Descriptive & inferential (tests of independence & regression modelling)	Compared terrorists and non-terrorists	Education, employment, age, gender, marital status, ethnic origin
Bakker (2006)	242 Jihadi terrorists in Europe	Secondary sources	Descriptive	Compared their sample with Sageman's (jihadi terrorist in Europe vs Salafi terrorists)	Gender, geographical background, socioeconomic background, education, father as youth, occupation, family status, criminal record, psychological factors, age, place of recruitment, faith, employment, relative deprivation, social affiliation
Bakker (2011)	336 Jihadi Terrorists in Europe/US between 2001 - 2009	Secondary source	Descriptive	No	Social background, psychological make-up, circumstances of joining the Jihad
Bloom et al. (2012)	61 convicted female PIRA members	Secondary source (open source database)	Descriptive	Yes – gender & PIRA phase of activity	Recruitment phase, recruitment age, birth & operational location, marital & familial status, employment type, roles & functions
Botha (2014)	95 associates of al-Shabaab & 46 relatives of	Primary source (interview)	Descriptive	No	Family structure & relationships, involvement of family & friends, who knew of joining, exposure to al-Shabaab, reason for joining, nature of the conflict, political

	associates of al-Shabaab				experiences, trust in the political system, education, age, period from introduction to joining, personality changes, emotion, perception of 'us' and 'them', reasons for staying
Brieger et al. (2011)	108 Islamic jihadist organisations	Secondary source	Inferential – regression modelling	Yes – organisation, behaviours, attributes	Group membership, age, experience, control of territory, state sponsorship, democracy, energy per capita, civil strife
Capellan (2015)	282 active shooters	Secondary source	Descriptive & inferential (chi-square/t-test)	Yes – by ideology (ideological vs non-ideological)	Age, gender, ethnicity, marital status, mental health, education, employment, ideology, social connectedness, event-level characteristics
Chermak & Gruenwald (2015)	974 domestic US extremists	Secondary source (ECDB database)	Descriptive & inferential (bi-variate, ANOVA, logistic regression)	Yes – ideology & time relative to 9/11	Ideology, race & ethnicity, mental illness, criminal history, military experience, timing of attack relative to 9/11, lone actor, motivation, diversity, social cohesion, social disorganisation, religious affiliation,
Corner & Gill (2015)	119 lone vs group actors	Secondary source	Descriptive & inferential (chi-square, odds ratio, regression modelling)	Yes – mental illness	Network connections, stressors, isolation, rationality, violence, mental disorder & comorbidity
Dhumad et al. (2020)	160 terrorists, 65 murderers, 88 controls	Primary sources	Descriptive & inferential (EFA, regression)	Yes – terrorist vs murderer vs control and by conduct disorder (present or absent)	Age, gender, marital status, education, employment, SES, children, family size, conduct disorder, family factors, childhood factors
Gergin et al. (2015)	2514 PKK 'martyrs'	Secondary source	Descriptive & inferential (ANOVA,	No	Gender, age, year joined, year died, age joined, age died

			regression modelling)		
Gill (2012)	219 Palestinian suicide bombers 1993-2008	Secondary source	Descriptive & inferential (t-tests)	No	Age, gender, education, catalysing events, familial bonds, distance travelled, targeting and lethality,
Gill (2015a)	119 lone actors	Secondary source	Descriptive, inferential & multivariate (SSA)	Yes – affiliation, lone-actor behaviours	Age, gender, education, employment, family, marital status, distal factors, proximal factors, attack preparation, attack commission, internet use, mental illness,
Gill & Horgan (2013)	1240 former PIRA members	Secondary source (open source database)	Descriptive	Yes – recruitment phase, town size, role	Age, gender, birthplace, operational location, town size, marital status & family, occupation, roles
Gill & Corner (2016)	111 lone actor terrorists	Secondary Source	Descriptive & inferential (Chi-square)	Yes – public vs private targets	Recent stressors, leakage, antecedent behaviours, attack planning, network capabilities, target choice
Gill & Young (2011)	219 Palestinian suicide bombers versus 510 terrorists indicted in the US	Secondary source	Descriptive & inferential (logistic regression model)	Yes – suicide bombers versus terrorists	Ideology, education, leadership, gender, age, marital status
Gill et al. (2014)	119 Lone Actors	Secondary source	Descriptive & inferential (ANOVA, Fisher's exact)	Yes – ideology, network connectivity, outcome (success/failure)	Sociodemographic, network characteristics and antecedent behaviours
Gill et al. (2015)	227 convicted UK terrorists	Secondary source	Descriptive, inferential, multivariate (SSA & chi-square & Fisher's exact)	Yes - target type, ideological motivations, attack type	Sociodemographic, network behaviours, antecedent behaviours, attack behaviours, post-attack behaviours & online behaviours

González et al. (2014)	40 female violent extremists	Secondary source (ECDB open source database)	Descriptive	Yes – ideology, type of attack	Year of attack, ideology, crime type, victim type, gender, age, relationship status, motivation, pregnancy, criminal history, loneness, relations with extremists, multiple offender count, witness/snitch
Gottschalk & Gottschalk (2004)	57 Middle Eastern terrorists	Primary source – semi-structured interview	Descriptive & qualitative analysis of interviews	No	Psychological orientations, pathological hatred, organised membership, legal status
Gruenwald, Chermak & Freilich (2013a)	Right-wing homicides from the US Extremists Crime Database (ECDB)	Secondary source	Descriptive & inferential statistics (bi-variate chi square analysis)	Yes – by Pantucci's 'lone wolf' types	Race, gender, age, criminal history, mental illness, substance abuse, participation in movement, affiliation, ideology, victim type, minorities, victim-offender relationship, weapon, victim deaths, co-conspirators
Heinkel & Mace (2011)	27 Muslim-American plots	Secondary source	Descriptive analysis	No	Gender, age, race, birth country, US state of residence, marital status, children, education, employment, socioeconomic status, hardships, criminality, plot characteristics (time since 9/11, number of offenders, known to law enforcement, command-and-control links, weaponry, type of attack, type of causality, type of target), online propaganda, travel abroad, use of informants/undercover FBI agents, motives ('war on Islam', desire to engage in violent jihad, US military action in the Middle East, hatred of Israel)
Hewitt (2003)	818 arrested/indicted for terrorist crimes, of those,	Secondary & primary sources	Descriptive	Yes – by ideology	Age, gender, ideology, employment, ethnicity, SES, social maladjustment (mental illness, college dropouts, economic failure,

	biographical data for 136				alcohol/substance abuse, criminality), social connectedness
Horgan, Gill et al. (2016)	71 lone actors & 115 mass murderers	Secondary source	Descriptive & inferential (bi variate & multivariate)	Yes – demographic, psychological, behavioural features	Sociodemographic, psychological, offense-related behavioural variables
Horgan, Shortland et al. (2016)	183 convicted terrorists in US 1995 - 2012	Secondary source	Descriptive	Yes – lone actor, group actors	Sociodemographic, ideology & wider network, use of informants, expressions of ideology, engagement, training, fraud & concealment, financing terrorism, management, attack planning, attack execution, involvement in a terrorist attack, indictment & sentencing
Khazaeli Jah & Khoshnood (2019)	37 lone-actor attacks	GTD	Descriptive	No	Age, gender, previous criminal record, type of criminal record, mental health, social status, social isolation (with mental disorder), migration status, known by security & intelligence agencies, mode of radicalisation, ideology, type of weapon, target/victim, fatality injury, leakage, type of attack, country of attack
LaFree et al. (2018)	1473 radicalised US citizens 1948-2013	Secondary source	Descriptive & inferential (bi-variate, regression modelling)	Yes, nonviolent by violent	Employment history, education, marital status, military experience, radical peers, radical family members, mental illness, rival groups, criminal record, gender, age, military experience
Lankford (2013)	12 suicide terrorists, 18 rampage shooters, 16 school shootings, 35	Secondary source	Descriptive & inferential (bivariate)	Yes – type of offender	Attack characteristics, offender characteristics (age, sex, social marginalisation, family problems, work/school problems, crisis event)

	workplace shootings				
Liem et al. (2018)	79 lone-actor events	Secondary source	Descriptive & inferential (chi-square & regression)	Yes – lone-actor versus homicide events	Age, gender, social connectedness, ideology, employment, marital status, education, event characteristics,
Lyons & Harbinson (1986)	106 Northern Irish murderers	Primary source (questionnaire)	Descriptive & inferential (bivariate)	Yes – political vs non-political	Time of day, day of the week, place of killing, method, victims, substance abuse, mental illness, sentence
Neo et al. (2017)	Jihadi terrorists	Secondary source	Content analysis, frequency distribution, frequency analysis, Pearson's $\chi2$	No	Ideology, psychology of group, preparatory behaviours
Pedahzur et al. (2003)	819 terrorists 1993-2002	Secondary source	Descriptive	Yes – nature of attack (suicide vs non-suicide)	Previous terrorism, education, ideology, age, marital status, socioeconomic status, gender
Perliger & Pedahzur (2016)	154 Islamic terrorists	Secondary source	Descriptive & inferential (logistic regression	Yes – level of involvement	Marital status, religious education, religious background, immigration status, age, position in group, education level
Perry et al. (2018)	62 vehicle-born lone attackers	Secondary source	Descriptive	No	Age, gender, marital status, children, education, criminal history, juvenile offending, imprisoned, socioeconomic status, mental illness, military experience, violent behaviour pre-attack, religiosity
Pyrooz et al. (2018)	1473 US domestic extremists	Secondary source (PIRUS database)	Descriptive & inferential (bivariate)	Yes – group involvement	Years of involvement, age, gender, race, generation, marital status, children, religion, education, poverty, unemployment, military service
Reinares (2004)	482 ETA militants	Secondary source	Descriptive	Yes – periods of time	Gender, age, marital status, territory, territory at recruitment, size of town, ETA

					speakers in town, origin of surname, occupation, socioeconomic status
Russell & Miller (1977)	350 terrorists from 18 Middle Eastern, Latin American, West European and Japanese groups	Literature review	Descriptive	No	Age, sex, marital status, rurality, socioeconomic background, education, occupation, method & place of recruitment, political philosophy
Saeed & Syed (2018)	Wanted Pakistani terrorists	Primary source	Descriptive	Yes – religious affiliation	Demographic & background characteristics
Sageman (2004)	117 Global Salafi Jihad terrorists	Secondary source	Descriptive & social network analysis	Yes – origin	Origin, socioeconomic status, education, faith as youth, occupation, family status, mental illness, personality disorders, age, place of recruitment, faith, employment, relative deprivation, friendship, kinship, discipleship, place of recruitment, worship
Sageman (2008)	Jihadists	Secondary source	Descriptive	No	Vicarious poverty, ideology, age, education, family, sexual frustration, criminal history, mental illness, circumstances of joining, friendship, kinship,
Sageman (2011)	Jihadists	Secondary source	Descriptive	No	
Schuurman, Bakker et al. (2018)	55 lone actor terrorists	Secondary Source	Descriptive & temporal sequencing	No	Personal background, social context, attack planning, attack preparation, leakage behaviour, post-preparation, related activities, temporal aspects of attack planning and preparation
Teich (2013)	73 Lone Actors N America & W Europe	Secondary Source	Descriptive	Yes – Pantucci's Typology	Year of attack, country, perpetuator, casualties, injured, success, attack type, actor type, ideology, description

van Leyenhorst & Andreas (2017)	Dutch Terrorist Suspects – Salafi/Jihadist in or around Syria	Primary Source	Descriptive	No	Sociodemographic
Weenik (2015)	300 'travellers' (Holland to Syria)	Secondary source	Descriptive	Yes – by behavioural problems	Nationality, age, gender, socioeconomic status, criminal history, behavioural disorders, mental illness
Weinberg & Eubank (1987)	451 female Italian terrorists	Secondary source	Descriptive & inferential (bivariate)	No	Group affiliation, role, time of arrest, age, place of birth, size of community, place of residence, relations to other terrorists, nature of relationship to other terrorists, occupation, political party
Zeman et al. (2018)	93 lone-actor terrorists	Secondary sources	Descriptive	No	Age, criminality, drug use, mental health, social connectedness, ideology, education, marital status, children, family background, minority status, SES, family socially excluded,

2.3.1 Individual risk factors for terrorism

Individual risk factors for terrorism can serve as 'markers' to inform the detection and disruption of terrorist threats. A substantial body of work now exists that examines these risk factors. A recent systematic review found some support for age, socioeconomic status, prior arrest, education, employment, relationship status, having a grievance, geographic locale, and type of geographic area, as factors associated with terrorism (Desmarais, Simons-Rudolph, Brugh, Schilling, & Hoggan, 2017). Some broad consensus is evident however as much disparity is apparent. It is widely acknowledged that no single, stable profile of a terrorist exists (Bouhana & Wikström, 2011; Gill, 2015a). Instead, it may be more useful to pursue an understanding of the processes that these indicators allude to, as some have demonstrated the multifinality of many of these risk factors (Corner et al. 2019).

Monahan (2012; 2016) synthesised much of the empirical research on individual risk factors for terrorism. A review identified ten of the most common indicators; age, gender, marital status, socioeconomic status, mental illness, criminality, suicidality, substance abuse, personality disorder, and personality. An updated synthesis of the literature included risk factors such as ideology, affiliations, grievances, moral emotions, and identities. Further evidence of these can be seen in Table 2.2. Drawing on this body of work, the following section reviews empirical evidence for some of the most prevalent individual risk factors evident in Table 2.2. These are age, gender, marital status, education, employment, socioeconomic status, psychological factors such as mental illness, mental disorder and substance abuse, and prior criminality.

2.3.1.1 Age

Offender age has been examined extensively. Desmarais et al. (2017) identified 15 studies which found empirical support for age as a risk factor associated with terrorism group

membership and 8 studies which found the same in research on terrorist attacks. More generally, there is some consensus that the mean age of violent terrorist action is 20 to 30 years old. In Table 2.2, disaggregating offenders by type identifies general trends. At the lower end of the range, Gill (2012) reports a mean age of 21.6 years in a sample of Palestinian suicide bombers. In a similar sample of Palestinian suicide bombers, Pedahzur, Perliger, and Weinberg (2003) note a mean age of 22.9 years. In the mid-range, studies of foreign fighter returnees (Weenink, 2015), female Italian terrorists (Weinberg & Eubank, 2008), ETA militants (Reinares, 2004), jihadi terrorists in Europe (Bakker, 2006; 2011) Dutch terror suspects (van Leyenhorst & Andreas, 2017), al-Shabaab members in Kenya (Botha, 2014), convicted female IRA members (Bloom, Gill, & Horgan, 2012), domestic extremists (Chermak & Gruenewald, 2015), and far-right group members, (Gruenewald, Chermak, & Freilich, 2013a) report a mean age range of approximately 22 to 28 years old. At the upper end, some studies find lone-actors to be older on average, with a mean age of 30 to 35 years old, (Gruenewald et al., 2013a; Horgan, Gill, et al., 2016; Perry, Hasisi, & Perry, 2018). La Free et al. (2018) reported a mean age of 34.2 years in a sample of radicalised violent and non-violent individuals in the US.

However, exceptions are evident and samples in Table 2.2 identify age ranges from as young as 13 years old (Gergin, Duru, & Çetin, 2015) up to 72 years old (Bakker, 2011). Whilst age can indicate relative risk of involvement in terrorism and there is some general evidence for age as a risk factor associated with terrorism, these findings may be difficult to operationalise in practice given the observed heterogeneity.

2.3.1.2 Gender

Considering gender, most terrorists are male. This is concordant with findings about violent offending and high-risk behaviour in general. However, the degree of gender

variability in terrorism is reportedly higher (Monahan, 2012). All of the studies in Table 2.2 report the majority of their sample to be male. Some specifically examine female terrorists (Bloom et al., 2012; González, Freilich, & Chermak, 2014; Weinberg & Eubank, 2008), yet all consistently report a male majority. Studies of Dutch suspected terrorists and foreign fighters report the highest prevalence of female subjects (van Leyenhorst & Andreas, 2017; Weenink, 2015), where approximately 15% of their sample were female. This may have some influence on the reported rates of marriage in terrorist samples.

2.3.1.3 Marital status

There is some evidence to suggest that being single and having no children are risk factors associated with terrorism. The inverse may also have a protective effect. Specifically, Desmarais et al. (2017) found being single and having no children related to terrorist group membership more so than terrorist attacks. Examining marital status in Table 2.2, in a sample of female convicted PIRA members, half were married (Bloom et al., 2012). Forty-six percent of Dutch terror suspects in or around Syria were also married (van Leyenhorst & Andreas, 2017). As previously stated, the latter sample cites a relatively high proportion of female terror suspects. Perhaps this can account somewhat for the elevated reported rate of marriage. Across other studies in Table 2.2, most terrorists appear single (Altunbas & Thornton, 2011; Chermak & Gruenewald, 2015; Gill & Horgan, 2013; Hamm & Spaaij, 2017; Horgan, Gill, et al., 2016; Horgan, Shortland, et al., 2016; LaFree, Jensen, James, & Safer-Lichtenstein, 2018; Lyons & Harbinson, 1986; Pedahzur et al., 2003; Perry et al., 2018; Reinares, 2004) with rates of marriage reported at approximately 30 – 40%. Some caveats exist, where Sageman (2011) finds most jihadi terrorists are married. Similarly, Bakker (2011) finds that (of the sample for whom data were available) 64% were married and 32%

were single. Gill and Young (2011) too, report most terrorists are married, yet most suicide bombers are single. Hence again, the evidence is mixed.

2.3.1.4 Education

Studies in Table 2.2 report varying levels of education in concordance with findings from Desmarais et al. (2017). For example, Horgan, Gill, et al. (2016) find lone-actors to be more educated than solo mass murderers. Nineteen percent had some level of postgraduate university education compared to the latter, where 24% had some degree of university education. Liem et al. (2018) compared lone-actor terrorists and homicide offenders and found the latter were significantly more likely to only be educated to a primary school level. Zeman et al. (2019) reported 42% of their lone-actor sample were educated to at least a tertiary level. In an analysis of 1, 473 radicalised US citizens, LaFree et al. (2018) found that 43.3% had a college degree. In contrast, in a sample of Northern Irish murderers, 43% had no GCE's (the equivalent of high school level examinations) (Lyons & Harbinson, 1986). In a sample of 183 convicted terrorists, Horgan, Shortland, et al. (2016) found that 57.4% of offenders had completed high-school. Disaggregating suicide bombers from terrorists, Gill and Young (2011) report 32% of indicted terrorists had some college education compared to 50% of suicide bombers who had the equivalent of a high school education. Levels of education are markedly varied across these samples and most likely do not provide a reliable indicator of risk.

2.3.1.5 Employment

Similarly, employment has been explored extensively and too demonstrates marked variance. This is again in accordance with findings from Desmarais et al. (2017) who found mixed support for employment as a risk factor associated with terrorism. In Table 2.2,

Altunbas and Thornton (2011) found 65.6% of male UK Muslims were employed, compared to 37.7% of UK Islamic terrorists. Reinares (2004) cites rates of unemployment as low as 0.6%. Similarly, of the 22 female PIRA Volunteers they could identify, Bloom et al. (2012) report just 9.1% were unemployed. Subjects were also more likely to be students or professionals than their male counterparts. Similar rates of unemployment (15 – 20%) are reported by Gill and Horgan (2013) and Bakker (2006). However higher rates of unemployment are observed in radicalised US citizens (69.2%) (LaFree et al., 2018), European Jihadists (30%) (Bakker, 2011), lone-actors (28%) and mass murderers (38%), (Horgan, Gill, et al., 2016), far-right loners (46.4%) and far-right group members (51.1%) (Gruenewald et al., 2013), and US lone-actors (Hamm & Spaaij, 2017). At the extreme, Horgan, Shortland, et al. (2016) reported that 83.5% of their sample were unemployed.

2.3.1.6 Socioeconomic status

Some findings demonstrate a significant association between socioeconomic status and terrorist outcomes (Desmarais et al., 2017). However, the terrorists in Table 2.2 come from a reasonably diverse range of backgrounds. Dhumad et al. (2020) examined financial situation across 160 terrorists, 65 murderers, and 88 controls. They found that 8.17% of terrorists were 'very poor', compared to 7.81% of murderers and 4.94% of controls. Bakker (2006), in a sample of 242 jihadi terrorists in Europe, reported 4% originated from an upper class, 41.7% from a middle class, and 54.3% from a lower-class background. Similarly, in a sample of US and European jihadists, Bakker (2011) found that most of the sample originated from a lower-class background. In an analysis of 819 terrorists between 1993 and 2003, Pedahzur et al. (2003) cite a socioeconomic score of 5.82 where 1 is high socioeconomic status and 10 is low. In a sample of 482 ETA militants, 63.2% originated from a working-class background compared to just 0.8% who came from an upper-class background (Reinares, 2004). In

contrast, Perry et al. (2018), in a sample of 62 vehicle-born lone-actors, found that 40% had a socioeconomic status equal to or higher than average. Similarly, Sageman (2004) found that most of a sample of global Salafi jihadists came from a middle-class background. In an analysis of 330 Middle Eastern, Latin American, West European, and Japanese terrorists, Russell and Miller (2008) noted that over two thirds of their sample originated from a middle- to upper-class background.

2.3.1.7 Mental illness and substance abuse

Rates of mental illness and disorder, as well as substance abuse, have been reported across a range of terrorists in Table 2.2. Reported rates of psychosocial problems range from 4-5% (Bakker, 2006; 2011) to 60% (Weenink, 2015). Some group-level studies note single instances of depression (Bakker, 2006), ADHD, psychotic disorder, borderline personality disorder and PTSD (Van Leyenhort and Andreas, 2017). Weenink (2015) studied police files of 140 Dutch individuals who became foreign fighters. Disorders included psychotic, narcissistic, attention-deficit/hyperactivity (ADD/HD), schizophrenia, autism spectrum, and post-traumatic stress (PTSD) disorders. In Corner, Gill and Mason's (2016) sample of 153 lone-actor terrorists, 1.3% experienced traumatic brain injury, 0.7% drug dependence, 8.5% schizophrenia, 0.7% schizoaffective disorder, 2.0% delusional disorder, 0.7% psychotic disorder, 7.2% depression, 3.9% bipolar disorder, 1.3% unspecified anxiety disorder, 0.7% dissociative disorder, 1.3% obsessive compulsive disorder (OCD), 3.3% PTSD, 0.7% unspecified sleep disorder, 6.5% unspecified personality disorder, and 3.3% autism spectrum disorder. In Gill et al.'s (2019) closed source study of 49 UK lone-actor terrorists, 12.2% experienced a mood disorder, 10.2% schizophrenia, 4.1% intellectual disabilities, and 2% an assortment of personality disorders.

Disaggregating terrorists, more nuance is evident. Research has consistently reported elevated rates of mental disorders in lone-actors versus group-actors (Corner & Gill, 2015; Fein & Vossekuil, 1999; Gill et al., 2014; Gruenewald et al., 2013a; Hewitt, 2003). Rates of mental illness in Northern Irish murderers were 58% in non-political cases and 16% in political cases. In a comprehensive analysis of mental illness in lone-actor terrorism, Corner and Gill (2015) found that lone-actors were 13.49 times more likely than group actors to suffer from at least one diagnosed mental illness. Similarly, Horgan, Gill, et al. (2016) found 39% of lone-actors had some degree of mental illness, compared to 48% of solo mass murderers. Considering substance abuse, 8.9% of lone-actors versus 17.8% of solo mass murderers demonstrated this risk factor. Thirty-four percent of right-wing loners, compared to 29.3% of loners also demonstrated problems with substance abuse, (Gruenewald et al., 2013a).

2.3.1.8 Criminal history

The terrorists in Table 2.2 demonstrate some history of criminal behaviour. The extent to which Desmarais et al. (2017) found criminal history to be associated with terrorism outcomes, was again, mixed. In Table 2.2, rates of previous offending range from 17% (Perry et al., 2018) to 61.7% (Gruenewald et al., 2013a), where Bakker (2011) found that a fifth of his US and European jihadist sample had a previous criminal record. Hewitt (2003) gathered secondary and primary source data on 818 individuals arrested or indicted for terrorist offences and detailed biographical data for 136 of those. In his sample, Hewitt (2003) noted that 19.1% were 'criminals.' Pape (2005), in a study of suicide terrorists, only found evidence of some petty criminality, similarly to Sageman (2011). In contrast however, Hamm and Spaaij (2017) observed a history of serious criminal offending in their lone-actor population. In an analysis of 27 Muslim-American plots, Heinkel and Mace (2011) observed that almost

half of their sample were known to law enforcement. Similarly, Horgan, Shortland, et al. (2016) found that 54% of 183 convicted terrorists had a prior arrest and 38% had been previously imprisoned.

Assessing the sociodemographic characteristics of terrorists is of no doubt a valid research interest. However, the extent to which such findings can infer a 'profile' of the common terrorist, is limited, as demonstrated by the heterogeneity evident above. Corner et al. (2019) demonstrated that individual-level risk indicators in trajectories to lone-actor violence were multifinal. That is, indicators play different roles at different points in pathways to violent extremism. This goes some way to accounting for the inconsistencies apparent across Table 2.2. Rather than focussing on individual factors, it is argued that observable patterns of vulnerability indicators could be indicative of the larger processes or mechanisms underpinning trajectories to terrorist violence. At the descriptive level of research, behavioural profiles exemplify a tangible progression from exploratory typologies to empirical conceptualisations of a range of different offenders. However, some broader limitations of behavioural profiles as conceptual tools are evident in Table 2.2.

2.3.2 Aggregate findings

Many of the behavioural profiles in Table 2.2 present aggregates which describe the 'average terrorist.' Whilst some trends may be evident, doing so may obscure the salience inherent to understanding extremist violence. In criminology, the salience observed at the periphery of offending behaviour is often the basis for conceptualising different types of offenders. Whilst behavioural profiles may acknowledge differences, some present averages of extremely heterogenous behaviours. The need to disaggregate these offending populations has been both called for and demonstrated empirically, (Gill, 2015a; Gill & Corner, 2013;

Gill & Young, 2011; Gruenewald et al., 2013a; Horgan, Gill, et al., 2016; Horgan et al., 2018; Horgan, Shortland, et al., 2016; Perliger et al., 2016).

Disaggregated analysis became a research agenda for many, in part, following the publication of a unique insight into far-right homicide in the US. Gruenewald et al. (2013a) analysed data from the Extremist Crime Database (ECD), looking at differences in characteristics such as race, mental illness, weapon-use, and victim-offender relationships. Using inferential statistics, they found significant differences between right-wing inspired homicide offenders and group-based offenders. These included findings such as that far-right offenders were more likely to be unmarried and have previous military experience than group-based offenders. These results had a significant impact on the field by tangibly demonstrating the heterogeneity that exists within extremist populations.

Some behavioural profiles do disaggregate actors (as can be seen in Table 2.2). For instance, Gill et al. (2014) examined sub-groups of lone-actor terrorists and found significant differences among lone-actors with different ideologies. Al-Qaeda affiliated lone-actors were 10 years younger than right-wing or single-issue lone-actors and were also more likely to be students or university educated. Similarly, an analysis of 183 global jihadists demonstrated the diversity of behaviours among a group that are often aggregated as a type of offender, (Horgan, Shortland, et al., 2016). Inferential statistics found differences among lone-actors and members of terrorist cells, such as that lone-actors spent less time active in terrorism, were less likely to have a partner, and more likely to be in the military at the time of an attack. These findings reiterate the heterogeneity of terrorism, yet Horgan, Shortland, et al. (2016' 1235) caveat their results stating that "this approach still risks conflating a highly heterogeneous sample of group actors." Over 80% of their sample had some sort of connection to a group or terrorist cell. By applying the dichotomy of lone-actor versus group-

actor to their sample, it is possible that their analysis overlooked differences among group actors. This alludes to a further limitation of behavioural profiles.

2.3.3 Dimensions of differentiation

Attention must be paid to *how* profiles are disaggregated. Often when behavioural profiles do consider sub-types, the variables upon which they are differentiated are researcher-defined. Similar to deductive typologies, doing so may mask patterns that exist naturally among the data. As can be seen in Table 2.2, behavioural profiles differentiate terrorists by type of offender (i.e. group actors versus lone actors) (Gill, 2015a; Gill et al., 2014; Gill & Young, 2011; Horgan, Shortland, et al., 2016; Lankford, 2013; Meloy & Gill, 2016), gender (Bloom et al., 2012), target type (Gill & Corner, 2016), recruitment phase (Bloom et al., 2012; Gill & Horgan, 2013) using typologies, (Gruenewald et al., 2013a; Teich, 2013), behavioural attributes (Breiger et al., 2011; Gill, 2015; Horgan, Gill, et al., 2016; Weenink, 2015), affiliation (Gill, 2015a), ideology (Chermak & Gruenewald, 2015; Gill, 2015a; Lyons & Harbinson, 1986; Saeed & Syed, 2018), involvement (Pedahzur et al., 2003; Pyrooz, et al., 2018) and more. As Horgan et al. (2018) demonstrated an alternative to deductive typologies, Breiger et al. (2011) demonstrate an alternative approach to constructing empirical profiles.

A different approach may be to look to the data to extract patterns of behaviour. Breiger et al. (2011) conducted an analysis of 108 Islamic jihadist organisations and their chemical, biological, radiological and nuclear weapon (CBRN) use. The authors appropriated regression modelling to detect clusters of cases that share a set of behavioural attributes. Traditional regression modelling analyses cases by the attributes of those cases. Breiger et al. (2011) repurposed regression modelling by computing the inverse to reveal networks of relations among the cases. The relations between cases were based on the distribution of the

behavioural attributes and allowed for the identification of multiple profiles of Islamic jihadist organisations.

Here, the authors disaggregated CBRN use among Islamic jihadist organisations by detecting homogenous clusters within the data. Similarly, Gill et al. (2015) explored the online behaviours of 227 convicted lone-actor terrorists. The authors used SSA to analyse 17 online behaviours such as disseminating materials, visiting chatrooms, and watching videos, and identified different themes in lone-actor terrorist online behaviour. For instance, Gill et al. (2015) identified a cluster of behaviours indicative of the passive consumption of static websites versus a second cluster that includes behaviours such as opting to commit violence and preparing for an attack. Pattern detection and behavioural clustering can reveal multidimensional profiles of different types of terrorists that may better capture the complexity of criminality. These models make strides towards the explanatory level of research as they employ more rigorous methodologies to validate exploratory and descriptive findings, and move towards having predictive utility.

This approach to researching terrorism may inform more comprehensive, multilevel classifications of terrorist behaviour. In order to do so, it is necessary to pursue more advanced, multivariate methodologies. Reviewing Table 2.2, most profiles rely predominantly on descriptive statistics to make statements about the average terrorist. Some quantify their statements with inferential or multivariate statistics, however some do not. This echoes the findings of a review of terrorism research which noted an increase in the use of largely descriptive statistics (Schuurman, 2018). Against a relative vacuum of empiricism, behavioural profiles represent an important advancement in terrorism research.

The application of behavioural clustering demonstrates the potential of an inductive approach to the study of terrorists. Doing so may allow researchers to build upon, and to some extent validate, knowledge established through deductive approaches. Individual risk

factors for terrorism have implications for the detection and threat assessment of terrorists, however a more stable approach, given their multifinality, may be to pursue a process-perspective that ties *patterns* of these indicators to the causal mechanisms they may speak to. Such an approach could contribute to the understanding of *how* some offenders come to pursue terrorist violence. Disaggregating the process of coming to commit an act of terror may also provide a more nuanced insight into how to mitigate the risks associated with different styles of offending.

2.4 A process perspective

In the absence of a terrorist profile, some have argued instead for a process perspective (Borum, 2011; Horgan, 2008; Malthaner & Lindekilde, 2017; Neo 2016). Tables 3 & 4 summarise research operationalising this approach. These are predominantly conceptual models however also include empirical models, both quantitative and qualitative. First, this section reviews conceptual models of terrorism. Second, it presents empirical models of terrorism to demonstrate how this process perspective has been operationalised thus far.

2.4.1 Conceptual models

Conceptual models make strides towards explaining *how* some offenders come to pursue extremist violence, however may lack the generalisability afforded by quantitative testing. Table 2.3 summarises these models by comparing the theory or evidence they are drawn from, the stages they propose, the phase they conceptualise, and the type of model presented. The conceptual models in Table 2.3 share some notable similarities. Most describe individual-level causal mechanisms that underpin trajectories to terrorism (Borum, 2003; Moghaddam, 2005; Neo, 2016; Precht, 2007; Sageman, 2008; Silber & Bhatt, 2007; Wiktorowicz, 2004), three present multi-level conceptual models (Bouhana, 2019; McCauley

& Moskalenko, 2008; Veldhuis & Staun, 2009) and one presents a conceptual framework for understanding involvement in terrorism, (Taylor & Horgan, 2006).

First, individual-level models discuss many of the same mechanisms in trajectories to extremism. Hence these are considered collectively. Common to all is the concept of an individual vulnerability that interacts with environmental factors leading to a 'cognitive opening,' increasing a person's susceptibility to an extremist narrative. For instance, Stage 1 of Neo's (2016) model of internet-mediated radicalisation is the Reflection Phase. This stage describes phase actions that identify vulnerabilities which make an individual susceptible to radical influence. Personality, individual-level vulnerabilities, and personal environment interact to increase a person's propensity for radicalisation. Neo (2016) refers to a process of 'cognitive opening' as a result of an experience of personal crisis that may make a person more susceptible to extremist ideologies. Factors such as alienation, a lack of belonging, loss of status, and thrill-seeking, can motivate a person towards an extremist narrative.

Table 2.3. Conceptual models of terrorism as a process

Author	Theory or evidence	Stages or phases	Phase	Type of model
Borum (2003)	Researcher analysis of multiple violent extremist groups	1. Grievance – social & economic deprivation 2. Injustice – inequality & resentment 3. Target attribution – blame 4. Distancing/devaluation – stereotyping & demonising the enemy	Radicalisation	Linear, progressive
Bouhana (2019)	Drawn from Situational Action Theory (Wikström, 2010)	Systems Social Ecology Settings Susceptibility Selection	Risk analysis framework relevant to all phases	Non-linear, emergent
McCauley & Moskalenko (2008)	Socio-psychological theory	Individual, group & mass level mechanisms 1. Personal victimisation 2. Political grievance 3. Joining a radical group (slippery slope) 4. Joining a radical group (power of love) 5. Extremity shift in like-minded groups 6. Extreme cohesion under isolation and threat 7. Competition for the same base of support 8. Competition with state power – condensation 9. Within-group competition – fissioning 10. Jujitsu politics 11. Hate	Radicalisation to action	Non-linear, emergent

		12. Martyrdom		
Moghaddam (2005)	Psychology theory (material conditions & overcoming perceived injustices)	1. Psychological interpretation of material conditions 2. Perceived options to fight unfair treatment 3. Displacement of aggression 4. Moral engagement 5. Solidification of categorical thinking	Radicalisation	Linear, progressive
Neo (2016)	Adapted from Weiman & von Knop's (2008) work & literature review	1. Reflection – triggers, needs & vulnerabilities 2. Exploration – making sense of new information 3. Connection – influence of online community 4. Resolution – re-triggering the need for action 5. Operational – preparing to contribute to cause	Radicalisation (internet-mediated)	Linear, progressive
Precht (2007)	Existing research & publicly accessible information from security services	1. Pre-radicalisation 2. Conversion & identification 3. Conviction & indoctrination 4. Action	Radicalisation to action	Non-linear, emergent
Sageman (2008)	Researcher defined	1. Moral outrage 2. Frame used to interpret the world 3. Resonance with personal experience 4. Mobilisation	Radicalisation	Non-linear, emergent
Silber & Bhatt (2007)	Drawn from existing models & evidenced with 5 case studies	1. Pre-radicalisation 2. Self-identification 3. Indoctrination 4. Jihadisation	Radicalisation	Linear
Taylor & Horgan (2006)	Conceptual framework	Problematic cognitions, setting events (distal & proximal), disaffection/political involvement, cognitive & social factors, access to facilitating community, personal contact,	Terrorist involvement	Conceptual framework

		community of practice, ideological exposure, pre-existing skills/interest		
Veldhuis & Staun (2009)	Literature review	Types of causes Macro level • Political • Economic • Cultural Micro level • Social (social identification, social interaction, group processes, relative deprivation) • Individual (psychological characteristics, personal experiences Types of catalysts Macro level • Trigger events Micro level • Social (recruitment, trigger events) • Individual (recruitment, trigger events)	Radicalisation	Root-cause model
Wiktorowicz (2004)	Interviews with Al-Muhajiroun & social movement theory	1. Cognitive opening 2. Religious seeking 3. Frame alignment 4. Socialisation	Radicalisation	Linear, emergent

Similarly, Silber and Bhatt (2007) propose a four-phase linear model of radicalisation based on the analysis of five homegrown terrorist incidents in the US and Europe. The first phase is the pre-radicalisation stage. Silber and Bhatt (2007) argue that the nature of a person's environment prior to exposure to an extremist ideology may make them more vulnerable to an extremist narrative. Social, demographic, and psychological factors interact with physical spaces and individual differences. The authors cite environmental factors, such as the demographic make-up of a town, as creating environments conducive to radicalisation. These are termed 'radicalisation incubators.' Those vulnerable to radicalisation usually live within these 'incubators' and share a number of sociodemographic indictors such as age, gender, social status, life stage, and psychological factors.

 Equally, Wiktorowicz (2004) proposes an account of joining radical Islam framed by Social Movement Theory (SMT). The model is based on case studies of members of the Al-Muhajiroun movement in the UK and outlines four processes. First, a process of cognitive opening. Most people exposed to radical Islam will reject the movement based on previous negative socialisation experiences. This mitigates the likelihood of self-seeking exposure to the narrative. However, personal crises, such as job loss, prejudice, or discrimination, can result in a cognitive opening that challenges prior beliefs. This experience of crisis can originate from the individual but can also be fostered by others through mechanisms of moral shock. Recruiters establish social ties with potential recruits and cultivate a sense of crisis by engaging in discussions about issues negatively affecting the group. Themes such as the 'war on Islam' create moral shock, resulting in personal crisis.

The development of an individual-level susceptibility to radicalising influences is evident, in some form, in all of the models identified in Table 2.3. Some detail further mechanisms that explain the process of coming to internalise an extremist narrative. Many of the models describe a process of 'seeking' or exploration, as a person searches for a narrative

to address their grievances. For example, the second phase of Silber and Bhatt's (2007) model is the self-identification stage. An experience of crisis precipitates a process of exploration whereby the individual becomes exposed to Salafi Islam. A cognitive opening exposes the individual to factions of an ideology that they may have rejected before an experience of crisis. An experience of moral shock can also precipitate a cognitive event that sees an individual seeking out extremist narratives that they may normally have rejected. This period of religious seeking is framed by the individual's social ties and can occur both on- and off-line through friends and family, or through the internet.

Equally, Stage 2 of Neo's (2016) model, the Exploration Phase, is where the individual begins to search online for information presented by extremist groups. The extent to which a person may be receptive to an extremist narrative depends on the nature of their vulnerability at Stage 1. The message of a wider movement must resonate and address any experience of crisis. The internet specifically facilitates this phase due to the speed and ease of access to a range of extremist materials. Neo (2016) delineates the progression of a new belief system after an initial exposure to extremist material online. A person can have two responses, the 'ignore' response, or the 'continue' response. If the radical material resonates, they are likely to continue to search for radical content. After a period of searching, the individual begins to internalise the message of the extremist group and seeks to establish connections with other extremists. The internet can facilitate these connections as individuals experience disinhibition online and can communicate with a much wider audience.

Similarly, Phase 2 of Precht's (2007) model is characterised by a period of conversion that can take three forms; from no religious practice to a religious identity, from a moderate religious identity to a radical religious identity, and from one faith to another. An individual enters a phase of conversion after a period of seeking, catalysed by feelings of frustration and a trigger event. Some find radical Islam meets the needs of their search and begin a period of

conversion. Triggering events can include personal-level triggers, such as a death in the family.

Lastly, Wiktorowicz (2004) too describes a process of religious seeking. Following a process of cognitive opening, a religious person is likely to turn to their beliefs as a source of comfort. A period of religious seeking can then be internal, or externally guided by members of the movement. This can lead to exposure to radicalising narratives which are internalised through discussion about how these beliefs can address a seeker's immediate needs. Influence from other extremists is most effective when subtle, as it instils a sense of independence in the seeker. If this narrative can meet the seeker's needs, a process of frame alignment results in the internalisation of the extremist narrative.

This process of cognitive frame alignment is key in a number of models in Table 2.3. For instance, Sageman (2008) describes cognitive frame alignment as a process of internalising a new extremist worldview. In order to do so, it is necessary for extremist groups to disseminate their worldview for consumption, effectively. Radical groups need to cultivate a frame that resonates with potential recruits. Personal experiences such as discrimination or prejudice can make a person more perceptive to the discrimination of others. Hence, promoting a narrative that cultivates the idea of 'the Western war against Islam', again, may resonate with those who face discrimination on the basis of their faith, on a personal level.

Equally, Stage 3 of Neo's (2016) model is the Connection Phase, which outlines the influence of other online extremists in creating a network and contributing to a new extremist framework. At Stage 2, the individual has begun to establish connections online. They are now primed for more extensive networking with other extremists. Neo (2016) refers to 'the echo chamber effect' where, now alienated from their previous social networks, a collective of extremists interact online, passing the same ideas back and forth, echoing the wider group

sentiments. This online socialisation has a direct effect on a person's behaviours, cognitions, and emotions. Prolonged association with these groups online can result in the normalising of violence and amoral rules to suit the group's needs. This process of internalisation and frame alignment is evident in models presented by Moghaddam (2005), Precht (2007), Silber and Bhatt (2007), and Wiktorowicz (2004).

Many of the models in Table 2.3 describe group-level mechanisms that contribute to cognitive frame alignment or intensify radical beliefs. Namely, mechanisms of group think, establishing 'us vs them' thinking, and subsequently, dehumanisation of the outgroup. For instance, Borum (2003) describes these mechanisms. The second stage of the model is exemplified by 'it's not fair.' The grievance is framed as an injustice that affects one particular group over another. The third phase identifies a target that the extremist group can attribute the injustice too; 'it's your fault.' Finally, establishing the outgroup as 'bad' precipitates a process of dehumanisation. Here, members of the group come to see violence against the outgroup as morally acceptable, as they view them as 'less human.'

Similarly, Moghaddam's (2005) narrowing staircase model demonstrates how these mechanisms interplay on trajectories to extremist violence, conceptualised as different 'floors.' On the second floor, feelings of discontent are attributed to a target group. Moghaddam (2005) describes the development of 'us vs them' thinking in establishing an out-group. Those who are willing to express their frustrations as physical violence, advance to the third floor. This floor is characterised by a shift in morality. Extremist groups seek to persuade new recruits to abandon their mainstream morality and adopt the morality of the wider movement. Extremists manipulate tactics such as fear, comradery, isolation, and secrecy, to promote a shift towards the organisational morality.

At the fourth floor, the individual is officially recruited and inducted into the terrorist organisation. Social categorisation exacerbates 'us vs them thinking,' as the new recruit

identifies as a part of the collective. Group membership intensifies their beliefs through mechanisms of group think. At the final floor, dehumanisation of the outgroup facilitates a violent attack in line with the group's morality.

Additionally, Precht (2007) describes a similar process in the development of homegrown Islamic terrorism. At Phase 3, the conviction and indoctrination phase, individuals internalise a radical worldview and begin to separate from their former identities. Mechanisms of group think intensify radical beliefs and new recruits engage in behaviours such as preparatory travel abroad or combat training. Finally, Phase 4 is the action phase. This stage is typified by planning and preparatory behaviours. At this phase recruits may engage in further training and travel whilst consuming extremist propaganda to solidify their resolve.

Further similarities are evident as multiple models describe the role of social ties, or a socialisation phase, in pathways to radicalisation (Neo, 2016; Precht, 2007; Silber & Bhatt, 2007; Wiktorowicz, 2004) as well as trigger events, or a tipping point (Neo, 2016; Precht, 2007), and some discuss a preparatory phase (Moghaddam, 2005; Neo, 2016; Precht, 2007). It is evident that a reasonable degree of consensus exists about the individual-level processes that theoretically underpin trajectories to terrorist violence. However, processes beyond the individual level are important to consider, and in some instances are lacking. Three models in Table 2.3 consider wider social and multi-level mechanisms.

First, McCauley and Moskalenko (2008) outline the mechanisms of political radicalisation as they describe pathways to terrorist violence. They consider the individual, group, and mass-public levels, as can be seen in Table 2.4. First, at the individual level, four mechanisms are discussed; *personal victimisation, political grievance, joining a radical group – the slippery slope*, and *joining a radical group – the power of love*. Personal victimisation refers to a personal grievance, such as the death of a loved one, as the

underlying motivation for terrorist violence. Examples of offenders who typify this route to violence include suicide bombers, who demonstrate a history of personal victimisation. Political grievances such as religious persecution or racial inequality can also motivate terrorist violence. This mechanism co-occurs more frequently with mental illness than any other.

Table 2.4. Reproduced from McCauley and Moskalenko (2008) mechanisms of political radicalisation at the individual, group and mass-public levels.

Level of radicalisation	Mechanism
Individual	1. Personal victimisation
	2. Political grievance
	3. Joining a radical group – the slippery slope
	4. Joining a radical group – the power of love
	5. Extremity shit in like-minded groups
Group	6. Extreme cohesion under isolation and threat
	7. Competition for the same base of support
	8. Competition with state power
	9. Within-group competition – fissioning
Mass	10. Jujitsu politics
	11. Hate
	12. Martyrdom

Second, McCauley and Moskalenko (2008) note that it is unlikely that a terrorist will pursue violent action alone. Therefore, the individual seeks to join a terrorist group. This process, *joining a radical group – the slippery slope*, is slow, and new recruits are often subject to tests of commitment before they are fully integrated. The individual undergoes a

process of self-radicalisation and becomes increasingly more extreme as they justify their actions.

Similarly, *joining a radical group – the power of love*, describes recruiters who exploit their social connections to recruit new members. Considering their operational security, it is more rational for extremist groups to recruit new members through established social networks. 'The power of love' refers to the comradery among group members that may entice a new recruit into an underground movement. This may also lead to groups of friends joining extremist networks together, as they seek to maintain this comradery. This mechanism of 'love' strengthens group ties as members share goals and experiences.

At the group level are, *extremity shift in like-minded groups, extreme cohesion under isolation and threat, competition for the same base of support, competition with state power (condensation)*, and *within-group competition (fissioning)*. Extremity shift in like-minded groups is known elsewhere as 'risky shift' or 'group extremity shift'. This 'shift' refers to the phenomenon whereby group involvement moves the collective opinion towards a consensus and increases an individual's alignment with the group's thinking.

Cohesion under extreme threat is exemplified by the tight-knit bonds evident between soldiers operating in small groups. Disconnection from the larger group intensifies these bonds and results in a cohesion that, when coupled with extremist views, can result in solidarity as the group radicalises. Cohesion requires internalisation of the group's goals as well as conforming to behavioural group norms. The group is strengthened by its social reality value. If members of the group belong to other groups, the social reality value of the group is weak. If members of the group are isolated from other groups, the social reality value of the group is strong. When the social reality of the group is strong, this has a more significant influence over the moral norms of the individual members.

Competition for the same base of support relates to the group's survival. Survival relies on the maintenance and replenishment of its members. Group may have to compete for members from a pool of new recruits. Some groups find success in escalating to more and more extreme radical action. However, this can also have a negative effect on recruitment as some are dissuaded by more and more extreme beliefs. Similarly, small groups can gain sympathisers through conflict with the state.

Small groups faced with repression from the state may lose members who deem counteraction fruitless. Those who are not dissuaded are more committed. This process is known as 'condensation'. As the conflict between the small group and the state escalates, more and more members are lost until a core group of highly radicalised members have condensed. Fissioning, on the other hand, results from inter-group conflict. As members of the group internalise the groups goals and beliefs, conflict may arise from differences in opinion. This conflict can lead to the group splitting into smaller groups. Therefore, the need for these groups to be highly cohesive may in fact have the opposite effect, as disagreements result in fractures.

Lastly, mechanisms at the mass-public level are *jujitsu politics, hate*, and *martyrdom*. Jujitsu politics refers to dynamics that operate among small groups and can be observed on a mass scale. Mass radicalisation is possible through the identification of a group through a national identity, for instance. An attack on the masses, therefore, can result in mass radicalisation. As an example, some terrorists commit attacks hoping for a response from the state in order to motivate mass radicalisation. The term 'jujitsu politics' is used as the process utilises its opponent's strengths against it.

Hate refers to the dehumanisation of the enemy through prolonged violent conflict. Members may come to view the enemy as less human and therefore feel justified in their increasingly extreme actions. This mechanism can account for attacks against seemingly

innocent groups such as children, whereby the attackers do not view their targets as human. Lastly, extremist groups often use martyrdom as a form of political violence. In order to maintain the power of persuasion, radical groups maximise the celebration of martyrdom amongst its members.

Second, Veldhuis and Staun (2009) argue for a root cause model of radicalisation over a phase model. The model examines both the micro and macro level causes of radicalisation, as can be seen Table 2.5.

Table 2.5. Categorisation of causal factors of radicalisation reproduced from Veldhuis and Staun (2009).

		Types of causes	Types of catalysts
Macro level		Political	Trigger events
		Economic	
		Cultural	
Micro level	Social	Social identification	Recruitment
		Social interaction & group processes	Trigger events
		Relative deprivation	
	Individual	Psychological characteristics	Recruitment
		Personal experiences	Trigger events

In general, the model states that macro level conditions are necessary for radicalisation, but that micro level conditions account for why some individuals become radicalised and others do not. Veldhuis and Staun (2009) also distinguish between causes and catalysts, where causes are the root of radicalisation, and catalysts propel potential extremists along the

trajectory. For example, at the macro level, types of causes include political, economic, and cultural events such as international war. Catalysts at the macro level are triggering events such as an attack on the collective that promotes a sense of injustice.

At the micro level, Veldhuis and Staun (2009) consider two subdimensions; the social and the individual level. Micro-social level causes include group processes and mechanisms of social identification, including relative deprivation. At the micro-individual level, causes include psychological characteristics and personal experiences. Personality characteristics such as narcissism or thrill-seeking interact with personal experiences such as a need for significance. At both sublevels, the authors describe the types of catalysts as recruitment and triggering events.

Third, Taylor and Horgan (2006) present a conceptual framework that outlines psychological processes in trajectories to terrorist involvement, as can be seen in Figure 2.1.
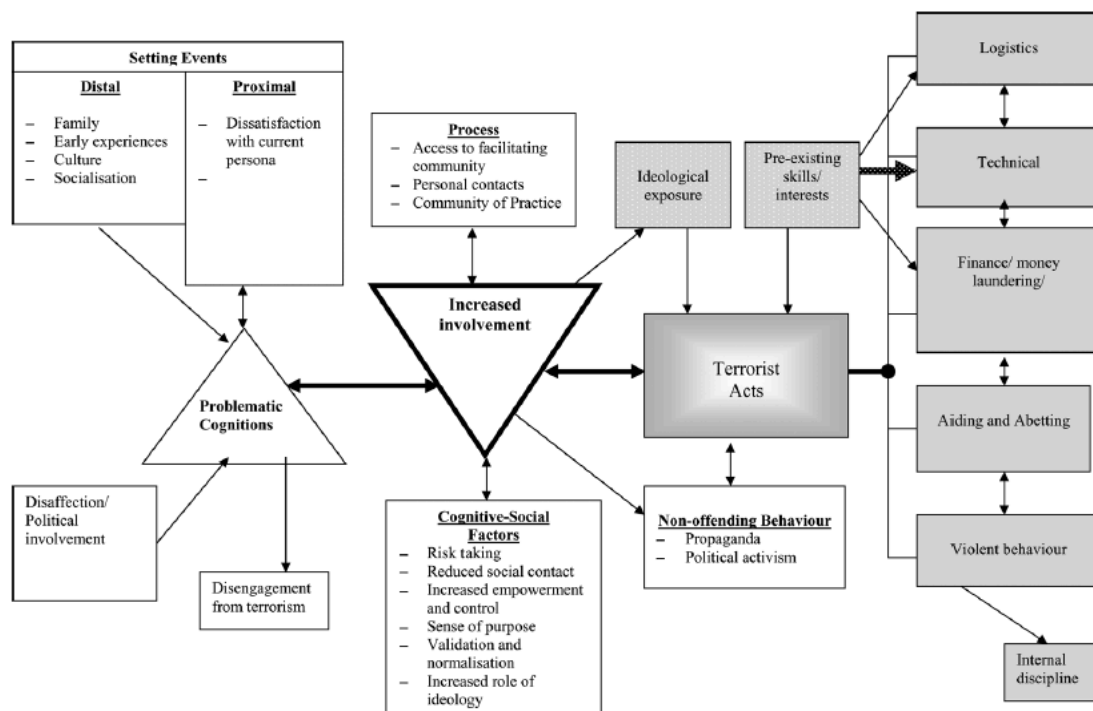
Figure 2.1. Taylor and Horgan (2006) model of terrorist involvement.

The model presents a range of factors theorised to influence the development of terrorist involvement. A key feature of the model is the role of problematic cognitions where the role of impaired higher order functioning is emphasised. Taylor and Horgan (2006) elaborate by specifying trajectories to formation and engagement with terrorist ideology.
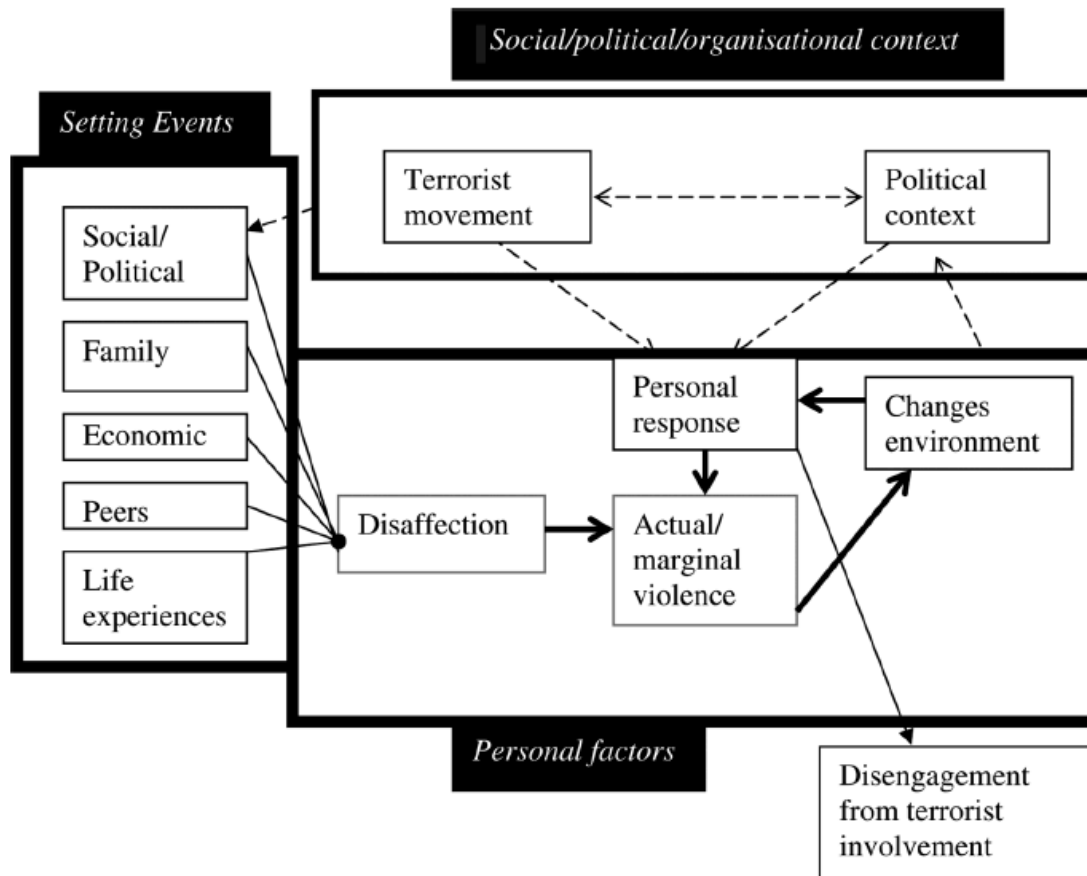
Figure 2.2. Taylor and Horgan (2006) 'Involvement with terrorism.'

Taylor and Horgan (2006) outline three key elements; *setting events, personal factors*, and *social/political/organisational context* (Figure 2.2). First, setting events refer to an individual's personal background, such as their religion, culture, and so on. These demographics are precursors to terrorist involvement yet offer little predictive value. However, these influences shape behavioural decision-making as a core part of a person's identity. The model distinguishes between involvement and event decision-making. Involvement decision-making refers to the process of deciding to join a criminal movement,

whereas event decision-making is likely quicker, as it relates to a specific criminal activity. Hence criminal involvement factors require a more in-depth process of decision-making based on a number of factors.

Personal factors are the environmental and psychological factors that contribute to a person's individual context. These differ to setting events which describe factors at the time of involvement. Finally, social/political/organisational context refers to a person's social context. Specifically, these factors relate to the social/political/organisational expressions of an ideology that influences a person's worldview.

Taylor and Horgan (2006) describe involvement in terrorism as a process that moves along a trajectory as these factors interact. At the first stages of involvement, setting events and personal involvement are key. What distinguishes those who pursue terroristic goals and those who do not may be the *nature* of the interaction of their personal context, setting events, and the social/political/organisational context. Importantly, in order to become radicalised, a person needs to be exposed to an extremist ideology. Therefore, it is necessary for the movement to disseminate their radical narrative effectively. This is comparable to a 'grooming' process.

Lastly, Bouhana (2019) presents the RAF which articulates how five determinants of factors interact to generate or supress the risk of extremist propensity development, and extremist action (see Figure 2.3).
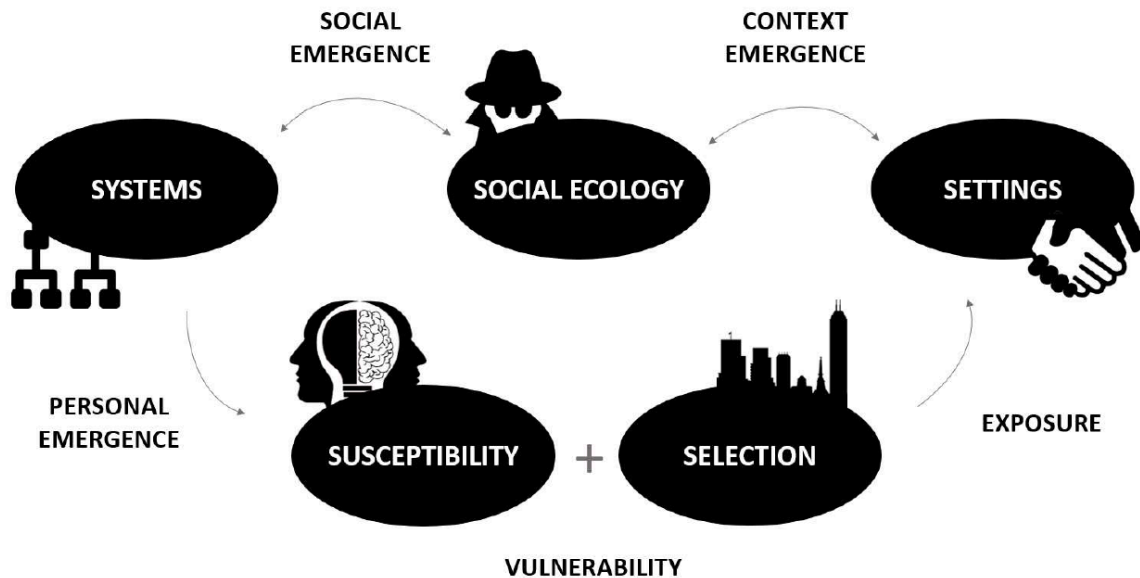
Figure 2.3. The Risk Analysis Framework (RAF) from Bouhana (2019).

The RAF is employed throughout this thesis for analytical guidance. The RAF draws

on Situational Action Theory (SAT) (Wikström, 2010) and opportunity theories to

hypothesise multilevel mechanisms that underlie causal processes in pathways to extremist

violence (Bouhana et al. 2016; Wikström & Bouhana, 2016). The framework, which

synthesises causal models of terrorism and radicalisation previously developed by Bouhana

and Wikström (2010; 2011; Wikström and Bouhana, 2016) was developed to articulate

relations between causal factors and processes at multiple levels of analysis (individual,

situational, social ecological, systemic), across each phase of an extremist event

(radicalisation, attack planning and preparation, attack).

The RAF conceives of the offence process as the outcome of the interaction between

individuals with action-relevant propensities and terrorism-supportive criminogenic settings,

whose features support these individuals' perception of their own capability to offend

(successfully), leading to the emergence of situations that trigger and sustain actors'

motivation to commit an act of terrorism. Individuals are understood as differing in their

susceptibility to environmental influences capable of inducing moral change (of which

radicalisation is a special case). As a general, interactionist framework, the RAF is organised

around these key mechanisms and processes, as opposed to discrete indicators, which are theorised to be subject to change and therefore unstable ground for risk assessment on their own (Bouhana et al., 2016; Corner et al., 2019).

While the RAF has been used to guide empirical research on lone-actor terrorists, it is in fact a general framework for the analysis of offending risk, being grounded in general theories of criminal development and crime, and articulating general mechanisms as opposed to offence-specific indicators. It is therefore an appropriate framework for the study of a range of lone-actor grievance-fuelled violence offenders (for instance see Clemmow, Gill, Bouhana, Silver & Horgan, 2020).

In sum, the models outlined in Table 2.3 articulate a process perspective to understanding terrorism. Research at the explanatory level may consider operationalising such an approach as the field continues to progress beyond the pursuit of a terrorist profile. One way to do so may be to disaggregate the *causes of the causes*, i.e. the causal processes which underpin violent extremism, rather than looking to prevalence rates of static indicators. Whilst theoretical models are essential to ground understanding and frame research, it is equally necessary to validate these models empirically. Therefore, it is pertinent to review how the field has operationalised a process perspective thus far.

2.4.2 Empirical operationalisations of a process perspective

Some have sought to operationalise the process perspective empirically, as can be seen in Table 2.6. Models are summarised by the theory or evidence they draw from, the mechanisms they operationalise, the phase they conceptualise, and the type of research conducted. Both qualitative and quantitative approaches are considered. Most operationalisations of this perspective are qualitative, presenting as 'pathways to terrorism.'

Table 2.6. Empirical operationalisations of the process perspective

Author	Theory or evidence	Factors or mechanisms	Phase	Type of research / model
Abbas & Siddique (2012)	In-depth interviews with 30 British Muslims. Interview 'themes' drawn from questions that have arisen from research on radicalisation	Social exclusion, Islamophobia, lack of effective theological & political leadership, regressive anti-terror law, geo-political events	Radicalisation	Qualitative (in-depth interviews)
Arjona & Kalyvas (2009)	Hypotheses formulated from individual & group level conjectures drawn from theories of civil war onset, agrarian rebellion & rebel recruitment. Tested in 732 ex-members of leftist guerrilla & right-wing paramilitary groups who joined a reintegration program in 2002	Grievance (socioeconomic status, occupation, access to media, political party, voting history, ideology, group meetings) Greed (material motivation, material sacrifice, employment status, income), Non-material selective incentives (security, insecurity), State Capacity, (statue rule, infrastructure, Community (friends & family, other, trust, interaction), Sovereignty (guerrilla rules, paras rules) Controls (age, rural, deserters, education)	Joining counterinsurgency groups	Quantitative (regression modelling)
Böckler et al. (2018)	Theoretically grounded pathway model of demonstrative violence	Processing of reality, grievances, identification, redefinition, clandestine planning, trigger, act of violence	Radicalisation to attack	Qualitative (theoretical coding & constant case comparison)

Capellan & Anisin (2018)	General Strain Theory (GST) & systematic analysis of 306 mass shooters	General strain, mental disturbance, acute stressor, group grievance, personal grievance	Radicalisation	Qualitative (crisp-set QCA)
Corner et al. (2019)	Risk Analysis Framework & systematic analysis of 125 lone actor terrorists	Moral & cognitive vulnerabilities, self & social selection	Propensity to post-attack	Quantitative (State Transition Diagrams)
De Waele & Pauwels (2016)	Criminological theory & systematic analyses of 30 right-wing sympathisers / group members	Procedural justice, personal discrimination, perceived group discrimination, attitudes, authoritarianism, ethnocentrism, anomia, personal superiority, Flemish superiority, Flemish identity, perceived group threat, moral support for extremism, pro-racist attitudes, peer delinquency	Radicalisation to participation in group	Quantitative (path analysis)
Florez-Morris (2007)	Interviews with 42 ex-Colombian guerrilla group members	Moral-cultural characteristics, human capital, political efficiency, spectacle of guerrilla groups	Joining a group	Qualitative analysis (theme detection)
Jensen et al. (2018)	Conceptual constructs derived from a review of radicalisation research & systematic analysis of 31 violent & 25 non-violent extremists	Personal crisis, community crisis, psychological vulnerability, psychological rewards, physical vulnerability, material rewards, recruitment, group biases, communicating group norms, cognitive frame alignment	Radicalisation to attack	Qualitative (process tracing & fs/QCA)
Lindekilde et al. (2018)	Relational approaches in the study of mobilisation and social movements and process tracing of 25 homegrown lone actors	Radicalising settings and relations	Radicalisation	Qualitative (process tracing)

First, conducting in-depth interviews with British Muslims, Abbas and Siddique (2012) examined perceptions of the processes of radicalisation and de-radicalisation in a sample of 30 Muslims from Birmingham. As can be seen in Table 2.6, interviews elicited themes such as social exclusion, Islamophobia, lack of effective leadership, regressive anti-terror laws, and geo-political events. Similarly, Florez-Morris (2007) conducted in-depth interviews with 42 former Colombian guerrillas to explore the individual motivations and processes involved in joining a violent group. Ninety-six questions enquired about subjects' lives before joining a guerrilla movement, their experiences as members of the group, and their life course after leaving the group. Results showed that subjects joined a guerrilla group most often because of socioeconomic inequality, feeling inspired by communist, theology of liberation, and nationalist ideals, and previous experience in a grass-roots organisation. Additional motivations included joining a guerrilla group as a response to the revolutionary climate, as a response to police brutality, under the influence of peers, family attitudes, restlessness, and religious motivations.

Taking a life course perspective, Florez-Morris (2007) analysed subjects' lives before joining a violent organisation. Prior to joining, most reported a period of normality and stability alongside active lifestyles and wider socioeconomic concerns. The process of joining entailed undergoing tests including handling pressurised scenarios such as engaging with weapons, like grenades. Family members who had a history of involvement in guerrilla movements were a significant influence during the process of joining. Peer influence was cited as equally influential as new recruits formed 'brotherly' bonds with fellow comrades whilst disengaging from their previous social groups. Religious influence was little to none, with only a few of their subjects citing religious reasons for joining a guerrilla movement.

Further studies in Table 2.6 employ a life course perspective. First, Jensen, Atwell Seate, and James (2018) used process-tracing to delineate life-course narratives for violent

and non-violent subjects who were radicalised in the US between 1960 and 2013. They identified four (one with five subsets) pathways to violent extremism. Eighty-five percent of the outcome set was accounted for by path 1 and the five subsets which shared a set of base characteristics. Here, the 'outcome' was defined as terrorist violence. Community crisis, psychological vulnerability, and psychological reward were common to all pathways. In path 2, community crisis and cognitive frame alignment were the only conditions necessary for the outcome. Path 3 demonstrated an interaction of psychological vulnerability, physical vulnerability, material reward, personal crisis, and cognitive frame alignment. Finally, path 4 combined community crisis, group biases, communicating group norms, and cognitive frame alignment to achieve the outcome.

Similarly, a comparison of German school attackers ($n = 7$) and lone-actor terrorists ($n = 7$) used qualitative methods to construct developmental pathways to demonstrative violence (Böckler, Leuschner, Zick, & Scheithauer, 2018). Biographical trajectories, life events, and turning points were coded by two researchers and collated to describe differential pathways to attack. The pathways highlight differences and similarities between the two types of offenders in terms of processing reality, grievance, identification, redefinition, clandestine planning, trigger, and act of violence. School shooters and terrorists demonstrated notable similarities. Both showed little evidence of mental disorder and demonstrated a functional processing of reality. Clandestine planning was conceptualised along a continuum, from strong social isolation to small group dynamics, in both. Trigger events were diverse, and both committed demonstrative acts of violence. The offenders differed in terms of their grievances and the processes of identification and redefinition. First, school shooters demonstrated grievances motivated by conflicts with parents and peers. Terroristic grievances centred around cultural disorientation. In terms of identification, school shooters identified with former school attackers and the so-called school-shooting script. Terrorists, conversely,

identified with Islamist and terrorist ideologies. Lastly, school shooters underwent a process of redefinition from failure to significance, whereas terrorist redefinition progressed from loneliness to social embeddedness.

Similarly, Capellan and Anisin (2018) used crisp-set QCA to analyse causal pathways behind ideologically motivated mass shootings, in a sample of 306 offenders. Non-extremist and extremist mass shooters were compared across characteristics such as mental health, grievances and strains. Five explanatory conditions were defined; *general strain, mental disturbance, acute strain/temporal stressor, group grievance*, and *personal grievance*. Results demonstrated that ideologically motivated mass shooters differed from non-extremist mass shooters in terms of the nature of their grievances and their experiences of strain. Specifically, crisp-set QCA highlighted two pathways in extremist mass shootings. The most salient pathway describes how group grievances interplay with mental disturbances in the absence of strain. Second, group grievances interplay with general strain, absent of acute strain and mental disturbance. The results suggest reconceptualising offenders who present similarly as grievance-fuelled violence offenders, or demonstrative violence offenders, rather than as distinct 'types.'

Lastly, Lindekilde, Malthaner, and O'Connor (2018) identified causal pathways to radicalisation in a sample of 25 lone-actors. They traced an offender's case history in reverse, originating from the development of the motivation to carry out a terrorist attack. Lindekilde et al. (2018) identified causal mechanisms along the trajectory. Cross-case analysis was used to order empirical observations in relation to one other, creating subscripts. This resulted in two causal pathways, each with three sub-types, classified as either *peripheral* or *embedded*. The subscripts consist of three stages where stages are conceptualised as processes made up of mechanisms. The causal pathways detail how different mechanisms result in relational radicalisation pathways.

Such approaches provide a more nuanced understanding of trajectories to terrorist violence. However, qualitative research is predominantly based on detailed analyses of small n's which draws into question their external validity. Both approaches to research are necessary in order to carve out the big picture, and subsequently validate any findings. Table 2.6 identifies three quantitative operationalises of the process perspective to understanding pathways to terrorist violence (Arjona & Kalyvas, 2009; Corner et al., 2018; De Waele & Pauwels, 2016). Studies tend to operationalise proxies of theoretical causal mechanisms in order to establish empirical evidence for the processes leading to violent extremism.

For example, Arjona and Kalyvas (2009) sought to explore why some people join illegitimate groups to fight against rebel groups in defence of the state. Drawn from theories of civil war onset, agrarian rebellion, and rebel recruitment, the authors formulated hypotheses at two levels; the individual and group level. The mechanisms they examined can be seen in Table 2.6. Arjona and Kalyvas (2009) tested hypotheses in a sample of 732 ex-members of leftist guerrilla and right-wing paramilitary groups in Colombia who joined a reintegration program in 2002. Results of regression modelling showed that groups did not differ in terms of their grievances. However, differences were found in terms of 'greed' factors, as inferred from greed theories. That is, the counterinsurgents appeared more motivated by material concerns than the paramilitary fighters; counter to what was expected based on theory.

Second, De Waele and Pauwels (2016) sought to address why some Flemish youth participate in right-wing disruptive groups. First, the authors proposed an integrative framework for studying right-wing group participation. Second, the authors used structural equation modelling (SEM) to empirically test theoretical constructs as causal mechanisms underlying the motivation of right-wing group participation. First, the framework was tested with a series of SEM models which examined the strength of direct and mediator effects of

perceived injustice, anomia, authoritarianism, and thrill-seeking. Second, the mediating effects of these on perceived superiority, Flemish nationalism, and ethnocentrism, as well as the outcomes in terms of moral support for right-wing extremism, exposure to racist peers, and participation in disruptive right-wing groups, were tested. Results suggested that group participation stems from perceived injustice, group threat, authoritarianism, and anomia. They outline the processes by which these factors motivate participating in disruptive groups. These mechanisms may elicit feelings of superiority, in terms of national identity, which when framed alongside group strains, can manifest as moral support for extremism. Moral support, alongside exposure to radical peers, can result in participation in disruptive groups.

Lastly, Corner et al. (2019) used state transition diagrams to demonstrate the multifinality of vulnerability indicators in trajectories to lone-actor violence. More broadly, the research aimed to 'bridge the gap' between quantitative and qualitative approaches to understanding pathways to violent extremism, and provide an insight into the underlying causal mechanisms that may drive the phenomenon. Corner et al. (2019) examined a dataset of 125 lone-actors and operationalised mechanisms of the RAF with behavioural proxies. Results demonstrated the differential roles of a number of risk factors and indicators associated with engagement in violent extremism, at different points in trajectories to engaging in extremism. Hence, relying on the individual markers for risk analysis may be problematic, given their evident multifinality. Instead, tying patterns of these indicators to the causal mechanisms they relate to may more stable grounds for risk analysis.

2.5 Conclusion

This chapter provides an overview of the evolution of terrorism research whilst highlighting a number of gaps in the literature. The progression of terrorism studies is tangibly observable across Tables 2.1 - 2.6 alone. However, opportunities to contribute to the

field remain. First, typologies of terrorists are a useful way to organise heterogenous offending populations, however much of the existing research is exploratory. As such, it often lacks the generalisability afforded by quantitative empiricism and moreover, cannot establish causality beyond theorising.

In contrast, descriptive-level research is markedly more empirical, however often lacks any consistent application of theory. The importance of a theory-driven approach has been explicated, however it remains necessary to continue to 'bridge the gap' between qualitative and quantitative approaches in terrorism research, as Corner et al. (2019) suggest. In pursuit of greater empiricism, theory must not be forgotten. Much can be contributed from the criminological and psychological sciences where existing theories of crime may provide important insights into terrorism (Freilich & LaFree, 2017). LaFree et al. (2018) demonstrate this empirically with a comprehensive analysis of the correlates of violent political extremism in the US. They draw from criminological theories to apply unique insights to an open source database (Profiles of Individual Radicalisation in the United States, PIRUS) of 1, 473 radicalised individuals in the US. The results demonstrate how theoretically grounded insights from criminology can have relevance to terrorism studies.

Empirical research on terrorism has had a substantial impact on counter-radicalisation and -terrorism, globally. However, issues persist. The lack of a terrorist profile is an important finding in itself. This suggests an alternative approach to analysing terrorist risk is needed. I suggest a more reliable approach is to look to patterns of interacting risk factors to articulate risk as the outcome of a dynamic system (Bouhana, 2019). Equally, understanding the correlates of terrorist violence in offending populations is just one 'piece of the puzzle.' It is also necessary to understand the prevalence of these correlates among the general population in order to inform judgements about what may be *relevant* to differentiate the vulnerable from the general population.

Hence this thesis provides a novel contribution in the following ways. First, by developing a theoretically informed, quantitative typology of person-exposure patterns in an offending sample. To do so, a number of correlates of terrorist violence are tied to theorised causal mechanisms specified by the RAF. This may be one way to operationalise theoretical guidance whilst preserving the benefits of descriptive research, i.e. that markers remain objectively observable. Second, by developing base rates. Two chapters focus on developing a methodology to generate base rates and then comparing these to an offending sample. Lastly, returning to an approach akin to that outlined in chapter 3, psychometric network modelling visualises the theorised dynamic system.

Chapter 3: Analysing person-exposure patterns in lone-actor terrorism: Implications for threat assessment and intelligence gathering

This chapter builds upon research operationalising a process perspective to understanding engagement in violent extremism, here, specifically lone-actor terrorism. I address gaps identified in the literature in two main ways. First, by *inductively* extracting patterns of risk factors and indicators from a dataset of lone-actor terrorists. I utilise analytical guidance from an explicit theoretical framework (the RAF) to tie these to hypothesised casual mechanisms, thus demonstrating one potential resolve to the issue of multifinality, whilst accounting for equifinality. Second, it builds upon much of the descriptive work outlined in chapter 2, which both called for and demonstrated the utility of disaggregating even sub-types of offending populations. Finally, potential practical implications for intelligence gathering and threat assessment are considered.

3.1 Introduction

Post 9/11, counterterrorism policing evolved towards an intelligence-led model of policing (ILP). Threat assessment, defined as "the application of the collection and analysis of information related to crime," is one of the key principles of ILP, (Capellan & Lewandowski, 2018; 17). The lone-actor terrorist population can be extremely heterogenous and a challenge for law enforcement to detect, and so a framework for guiding the threat assessment of these offenders may serve as a beneficial tool for ILP. As reviewed in chapter 2, typologies can be a useful way to conceptualise complex, heterogeneous offending populations and crime events. Various studies of a range of crimes have evidenced the usefulness of typologies in terms of increasing arrest rates (Fox & Farrington, 2015), decreasing recidivism (Carbajosa, Catalá-Miñana, Lila, & Gracia, 2017), and predicting

violence risk (Mohandie, Meloy, McGowan, & Williams, 2006). I argue that disaggregating an empirical typology of lone-actor terrorism can have a similar practical utility, specifically as a framework for guiding the threat assessment of these offenders within the context of an ILP approach to counterterrorism.

Detecting and disrupting lone-actor terrorist attacks is a central focus of policing, globally. Intelligence-gathering, defined as "a process that involves the collection and transformation of data into knowledge and finally actionable and useable recommendations for courses of actions," (Kebbell & Porter, 2012, pg. 213, see also Ratcliffe, 2008) is key. Threat assessment involves making intelligence- and evidence-based decisions about the allocation of limited resources and the responses of appropriate agencies (Tusikov & Fahlman, 2009). Hence, ILP places a great emphasis on acquiring, evidencing, and actioning appropriate intelligence. Kebell & Porter (2012) describe the need for a framework to guide intelligence gathering. Specifically, they identify the need for clarity regarding what intelligence to collect, as well how to operationalise intelligence in decision-making. The authors conceptualise this as a "risk-based, intelligence-led approach to counter-terrorism." (Kebell & Porter, 2012; 224). A typology that disaggregates and articulates the relations between *patterns* of indicators and ties these to causal mechanisms, may provide the necessary guidance for a risk-based intelligence-led approach to countering this threat.

As previously described, disaggregated analysis became a research agenda for terrorism scholars, in part, following the publication of Gruenewald et al.'s (2013a) unique insight into far-right homicide in the US. These results had a significant impact on the field by highlighting the heterogeneity within extremist offending populations. Further research demonstrated the need (and advocated for) disaggregated analysis moving forward (Gill, 2015a; Gill & Corner, 2013; Horgan et al., 2018; Horgan, Gill, et al., 2016; Horgan, Shortland, et al., 2016; Perliger et al., 2016).

Typologies of a range of equally complex offending populations, demonstrate the utility of a more rigorous, quantitative approach to disaggregating these populations. For example, Gruenewald and Kelley (2014) disaggregated a population of anti-LGBT homicides by characteristics of victim selection by offenders and conceptualise two types; predatory and responsive homicide (see also Gruenewald, 2012). Their analysis compares differences across a number of characteristics of the offence, including offender, victim, situational, attack, and aftermath characteristics. The focus on situational characteristics of bias homicide stems predominantly from Tomsen's (2002) work on anti-homosexual homicide in Australia, which has particular relevance here. Often, explanations of lone-actor terrorist behaviour focus predominantly on individual-level characteristics and neglect the role of the individual's context, or situation. I argue it is necessary for a typology of lone-actor terrorists to articulate the relations between a person and their environment to better inform judgements of risk, conceptualised here as person-exposure patterns (PEPs).

Chapter 2 highlighted limitations of existing typologies of terrorists. In terms of lone-actor terrorists specifically, existing conceptualisations of these offenders predominantly differentiate offenders along a single behavioural dimension (Pantucci, 2011; Phillips & Pohl, 2012; Simon, 2013). These dimensions are largely constructs identified by researchers and retroactively applied to a set of cases. Typologies such as these serve an important function in terrorism research however their external validity may be limited given the use of predominately qualitative methods. For the purpose of threat assessment, I argue that more rigorous quantitative methodologies and an inductive approach to typology development may be more appropriate.

To address many of these issues, Horgan et al. (2018) used multidimensional scaling (MDS) to disaggregate terrorist involvement and proposed a behavioural typology of violent extremist offenders. Drawing on methods from investigative psychology, this approach offers

an alternative to deductive typologies in that types are not organised around predefined dimensions. The present study aims to disaggregate lone-actor terrorists in a similar way. I seek to detect multidimensional sub-types that are embedded within the data, while conserving the benefits of a theory-informed approach through interpretative guidance from an explicit analytical framework. Such an ambition has been called for elsewhere (Borum, Fein, & Vossekuil, 2012).

In forensic psychology and criminology, techniques such as cluster analysis have been used to derive empirical typologies of a range of criminal behaviours. These typologies are multidimensional, polythetic, and span the offending process. Researchers have drawn from theories of crime to hypothesise causal mechanisms across multiple offending components, at multiple levels of analysis of the crime-commission process. One notable design uses cluster analysis informed by developmental theories of crime to disaggregate typologies of sexual offenders (Proulx, Beauregard, Lussier, & Leclerc, 2014a). These typologies are equated to pathways, which demonstrate how different styles of interaction between theorised offence components may drive criminal offending.

Likewise, the present study applies cluster analysis and theoretical guidance from the RAF to a dataset of 125 offenders. I set out to uncover person-exposure patterns (PEPs) that could meaningfully typify the relationship between the individual propensity, situation, and exposure components of the attack process. The results suggest that four PEPs characterise these relationships. I discuss the implications of these findings for lone-actor terrorist threat assessment, in the context of an ILP approach to counterterrorism.

3.2 Analytical approach

3.2.1 Background

The case has been made that an individual-level, profile-based approach is not sufficient to understand how some people come to pursue extremist violence, and therefore counter it (Horgan, 2008). To move forward and enhance prevention and disruption, it has been argued that it is necessary to investigate the mechanisms, as well as their associated indicators, which underpin the interaction between personal and environmental factors in extremist violence (Bouhana & Wikström, 2011; Wikström & Bouhana, 2016).

A concrete step in this direction is the development of empirically-derived typologies, which identify *patterns* in offender development and the associated behavioural indicators. Such studies conceptualise the offence process into distinct components and use cluster analysis to detect meaningful groupings of indicators within each. These groupings can be inferred as relating to mechanisms that underpin the process of committing a crime. An explicit theoretical framework allows researchers to infer causal mechanisms along trajectories to crime, producing comprehensive and meaningful types that have implications for the threat assessment and management of these offenders.

For example, this analytical strategy has been used to develop a typology of child molesters. Beauregard, Proulx, and Leclerc (2014) sought to address two issues in existing typologies of child molesters. First, most typologies neglect some aspect of the offending process, such as modus operandi. Second, drawing on work from situational crime prevention and child molestation (Wortley & Smallbone, 2006), the authors aimed to operationalise situational factors in sexual offending. The offending process was theorised as five components operationalised using observable indicators. These were: *personality characteristics, general lifestyle during adulthood up to one year prior to the index offence, sexual lifestyle up to one year prior to the index offence, pre-crime factors in the year prior to the index offence*, and *modus operandi*. Cluster analysis of 64 convicted extra-familial child molesters identified profiles within each of the components. A second cluster analysis

combined these into three trajectories: *the non-coercive deviant, the coercive deviant,* and *the coercive non-deviant* pathways.

Beauregard et al. (2014) discuss their findings in relation to existing typologies of child molesters and refer to theoretical models of child molestation to contextualise their empirical types. For example, the non-coercive deviant pathway is characterised as *total problem* (a pattern of general lifestyle problems including social isolation and poor self-image) within the general lifestyle component, *hypersexual deviant* (deviant sexual fantasies) within the sexual lifestyle component, *lonely* (loneliness and low self-esteem) within the pre-crime component, and *non-coercive* (deviant sexual fantasies, premeditation, non-coercive and favours male victims) within the modus operandi component. These offenders have dependent-avoidant personalities, low self-esteem, and avoid socialising with adults. This precipitates loneliness and a proclivity for engaging in professional and social activities with children (i.e. babysitting). Their offenses are typically fuelled by deviant fantasies and they select vulnerable victims from dysfunctional backgrounds. These offenders are largely non-coercive in order to simulate intimacy with their victims, who are often male. Features of this type are evident in typologies of sex offenders in general, as well as in other typologies of child molesters.

This analytical strategy has been used further to develop typologies of a range of offenders, including non-serial sexual killers (Stefanska, Carter, Higgs, Bishopp, & Beech, 2015), sex offenders who target marginalised victims (Horan & Beauregard, 2017), extrafamilial sexual aggressors against women (Proulx, Beauregard, Lussier, & Leclerc, 2014b), intrafamilial child sex offenders (Leclerc, Beauregard, Forouzan, & Proulx, 2014), extrafamilial sexual aggressors against adolescents (Brouillette-Alarie & Proulx, 2014), and marital rapists (Proulx & Beauregard, 2014). Hence, there are grounds to believe that this methodology can be applied to develop a meaningful typology of person-environment

interactions that span the lone-actor terrorism offending process. It is important to note here that this typology is not intended to classify different 'types' of people. Instead, as a typology of interactions, it is intended to classify groups of indicators, or markers, for processes that underpin trajectories to lone terrorist violence.

3.2.2. Analytical rationale

First, it is necessary to conceptualise the lone-actor terrorist attack process into distinct, but analytically-related components, and to relate these components to meaningful, observable indicators. To do so, the RAF, outlined in chapter 2, is adopted as theoretical guidance. To operationalise the RAF's analytical guidance in a way that would be compatible with the aforementioned clustering procedure and with the practical demands of risk assessment, the lone-actor terrorist offending process was divided into three components: *propensity* (operationalised by proxy indicators of susceptibility and action-relevant propensity), *situation* (operationalised by proxy indicators of motivation, capability, and the features that support their emergence and maintenance), and *exposure* (operationalised by proxy indicators for exposure processes, notably relational, i.e. network indicators).

It is also important to note that no claim is made that actual estimates of propensity, which would require rather more direct measurements than are feasible in this space, are being produced. Rather, I use theory to inform the selection of specific proxy indicators. The RAF is meant to enable the operationalisation of theoretical models and these are the kinds of indicators which operational analysts can realistically access. While the procedure is admittedly crude, the argument is that imperfect analytical guidance is better than no guidance at all.

As stated, propensity refers here to a person's disposition to engage in acts of terrorism and is conceptualised as the outcome of the radicalisation process; hence, as a

product of the causes of causes of terrorism (Schmid, 2013). This process of development of a terrorist propensity has been established as an important component of the offending process. Radicalisation has been modelled extensively (Borum, 2003; Moskalenko & McCauley, 2011; Neo, 2016; Sageman, 2008; Silber & Bhatt, 2007; Veldhuis & Staun, 2009). Furthermore, conceptual models of pathways to terrorism consistently refer to a 'radicalisation' phase (Dean, 2007; Gill, 2008; Holbrook & Taylor, 2017; Moghaddam, 2005; Moskalenko & McCauley, 2011; Precht, 2007; Taylor & Horgan, 2006; Wiktorowicz, 2004). Past empirical studies have examined factors thought to influence a person's propensity to engage in terrorism, such as national identity and attitudes (Miller, 2011; Tausch & Karoui, 2011), belonging and autonomy (Crone & Harrow, 2011), religious attitudes, beliefs, and ideologies (Loza, 2011; Loza, Abd-El-Fatah, Prinsloo, Hesselink-Louw, & Seidler, 2011), religious identity, political attitudes, and suicidality (McCauley & Scheckter, 2008), and other risk factors associated with radicalisation (Smith, 2018).

The second component, situation, relates to an offenders' context in the build-up to violence. These include behaviours involved in attack planning and preparation, as well as behaviours related to operational security, which have increasingly been examined empirically (Gill, 2015a; Gill et al., 2014; Gruenewald et al., 2013a; Hamm & Spaaij, 2017; Horgan et al., 2016; Sageman, 2004, 2011; Schuurman, Bakker et al., 2018; Smith, et al., 2006; Spaaij, 2010; 2011). These proximal factors have important implications for the risk assessment of these offenders, as they can signal the emergence and maintenance of a motivation to pursue terrorist violence (Bouhana, 2019; Meloy & Gill, 2016).

The final component, exposure, here refers to interactions with other extremists, groups, their materials, or wider movements. The question 'how alone are lone-actors?' has been empirically examined, with findings largely indicating that they are not as 'lone' as is often believed (Bouhana et al., 2018; Borum, 2013; Borum et al., 2012; Gill et al., 2014;

Hamm & Spaaij, 2017; Holt et al., 2019; Hofmann, 2018; Schuurman, Lindekilde et al., 2018; Smith et al., 2015). However, some do appear to act in relative isolation, even if they do not make up the majority of cases. Conceptualising exposure as a component operationalises some of the factors hypothesised to sustain offender perception of capability (i.e. support received from others) and therefore their motivation to act. It may also contribute to the ongoing debate about the 'loneness' of lone-actor terrorists and its implications for risk assessment.

3.3 Method

3.3.1 Data

This study makes use of a pre-existing dataset of 125 lone-actor terrorists (Corner et al., 2019). Each lone-actor terrorist was coded based on a behavioural codebook of over 200 variables derived from the wider research literature (Gill et al., 2014). The data were compiled from open sources including sworn affidavits, court reports, first-hand accounts, and news reports obtained predominantly via LexisNexis searches. Additional sources, such as biographies and scholarly articles, were used where available and relevant.

First, three independent coders coded the objective absence or presence of a behavioural indicator. Second, the three coders engaged in a two-stage reconciliatory process. First, coder A reconciled observations of behaviours with coder B. Where differences were apparent, the original source documentation was checked for veracity. Second, coders AB were reconciled with coder C. Again, coding disparities were resolved by one of the principal researchers who revisited the original sources and factored in the reliability of the documents when making decisions.

This decision-making was guided by a 'continuum of reliability,' where each source was plotted along a scale from 'most reliable' to 'least reliable.' Sources such as court

transcripts and associated documents, for example, were considered the most reliable. Competency evaluations, sworn affidavits, and indictments, were deemed reliable. Statements (verbal or written) made by the offenders or affiliated groups, were deemed somewhat reliable, as well as warrants and expert witness reports (which may be subject to unreliability and bias). Separately, media sources were also plotted along a reliability continuum where 'least reliable' were sources such as personal opinion blogs and 'most reliable' were non-tabloid newspapers.

The defining criterion for assigning the label 'lone-actor terrorist' to an individual was whether subjects carried out or planned to carry out, alone, an attack in service of some form of ideology, for which they were convicted or died in the attempt. The lone-actor terrorists in the sample can operate with or without command and control links. Some operated autonomously and independently of a group (e.g. in terms of training, preparation and target selection). Within this group, some may have radicalised towards violence within a wider group but left and engaged in illicit behaviours outside of a formal command and control structure. Those with command and control links, on the other hand, were trained and equipped by a group, which may have also chosen their targets, but attempted to carry out their attacks autonomously. All individuals planned their attack in the US, UK, Europe, or Australia between 1990 and the end of 2015.

3.3.2 Procedure

3.3.2.1 Offending process variables

As stated, the lone-actor terrorist attack process was broken down into three analytically-meaningful components: propensity, situation, and exposure.

Propensity. The propensity component was operationalised using 23 dichotomous variables: (1) university experience; (2) victim of physical abuse during

childhood/adolescence; (3) perpetrator of domestic abuse in adulthood; (4) victim of bullying during childhood/adolescence; (5) previous criminal convictions; (6) first exposure to ideology was in prison; (7) individual grew up in a religious household; (8) individual underwent a religious conversion; (9) evidence of thrill-seeking behaviour; (10) impulsivity; (11) problems with anger management; (12) inflexibility to change; (13) over-confidence; (14) individual required special attention as a child; (15) violent behaviour in childhood; (16) evidence of crisis before the first exposure; (17) psychological distress; (18) history of substance abuse; (19) a pattern of self-isolation; (20) first exposure was online; (21) chronic stress; (22) lived alone at the time of the adoption of a radical ideology; (23) diagnosed mental illness.

Situation. The situation component was operationalised with 33 dichotomous variables. These indicators were coded as present if they occurred in the build-up to an attack. For example, 'angry leading up to the event' here, differs from 'problems with anger management' at the propensity component. The latter is a distal indicator of a predisposition whereas the former is a situational indictor of an offenders' context: (1) produced letters/public statements; (2) made verbal statements to friends/family; (3) verbal statements to a wider audience; (4) others were aware of their grievance; (5) others were aware of their ideology; (6) evidence of a specific event warning; (7) changed address prior to the event; (8) recently unemployed; (9) sought legitimisation from public/religious figures; (10) proximate life change; (11) altered appearance for the attack; (12) denounced others who shared their ideology; (13) received training for the attack; (14) received training online; (15) engaged in dry-runs; (16) evidence of bomb manuals in their home; (17) recent work stressor; (18) interrupted in working on a proximate goal; (20) victim of an injustice; (21) experienced being disrespected; (22) experienced being ignored; (23) someone important to them demonstrated they did not care; (24) victim of a verbal or physical assault; (25) experienced

being a helpless victim; (26) problems with personal relationships; (27) financial problems; (28) angry leading up to the event; (29) escalating anger; (30) desire to hurt others; (31) recently under elevated stress; (32) travel to engage in preparatory activities; (33) unrelated violent behaviour before the event.

Exposure. Exposure was operationalised with 14 dichotomous variables: (1) spouse/partner part of a wider movement; (2) face-to-face interactions with members of a wider network; (3) virtual interactions with members of a wider network; (4) others involved in the procuring of weaponry/technology; (5) others involved in the building of IED devices; (6) someone else knew about their research/planning prior to the event; (7) evidence of control and command links; (8) member of a small militant group; (9) tried to recruit others; (10) group claim; (11) rejected from a group (12) read propaganda from a wider movement; (13) read literature on other lone-actor terrorists; (14) read the propaganda of other lone-actor terrorists.

3.3.2.2 Analytical strategy

Developing the typology proceeded in two phases. First, cluster analysis was used to identify profiles within each of the components of the attack process. The two-step cluster analysis function in Statistical Program for Social Sciences (SPSS) version 25 was used to conduct the analyses. Cluster analysis identifies homogenous groups of cases, where the grouping is not known. The objects of the clusters are the cases and the attributes by which they are clustered are the variables. The result is homogenous groups of cases that share a set of attributes. First, two-step cluster analysis forms pre-clusters. This reduces the size of the matrix of distances between all possible pairs of cases. In this way, two-step cluster analysis is capable of handling large amounts of data, quickly. The data were categorical and so the log-likelihood distance measure was used. Second, the nature of the clusters is determined by

a hierarchical clustering algorithm. Hierarchical clustering computes solutions from 1 to n, whereby at n solutions each case is a cluster. The optimal number of clusters is determined by Bayesian Information Criterion (BIC). This is the first stage.

The second stage identified patterns of indicators across the three components of the attack process. Bi-variate analysis first established if the clusters identified at the proposed components were related. Lastly, a further cluster analysis was performed on first-stage cluster membership. This allowed for the identification of person-exposure patterns that traverse the offending process. One way to measure the quality of the cluster solution is the silhouette measure of cohesion and separation. A summary of this measure is provided in the model summary and output generated by the analysis procedure in SPSS. This measure articulates how cohesive the clusters are within themselves and how separate they are from one another. Potential values range from -1 to +1. The values are summarised as poor, fair, or good in the model summary. A value summarised as fair, for example, would indicate a fair degree of separation (the clusters are fairly distinct from one another) and cohesion (the clusters are fairly homogenous within themselves). This can further be seen by examining the frequency tables presented in the following results section.

3.4 Results

The clusters identified at each component were labelled by interpreting the presenting patterns of indicators, guided by the RAF.

3.4.1 Propensity

Cluster analysis of the propensity component identified two clusters (see Table 3.1). Given the variables that made up these clusters, they were labelled the *unstable* (n = 40) and *stable* (n = 85) clusters. The silhouette measure of cohesion and separation was .3, which is

fair. In the following tables, indicators appear in order of their salience and importance to the cluster, as determined by the algorithm. Highlighted in bold are the most salient features of each cluster.

Table 3.1. Prevalence of propensity variables by cluster.

| Propensity variables | Clusters | |
	Unstable (n = 40)	Stable (n = 85)
Impulsivity	**85.0%** **(n = 34)**	**12.9%** **(n = 11)**
Difficulties with anger management	**80.0%** **(n = 32)**	**17.6%** **(n = 15)**
Inflexibility or inability to adapt to challenges/obstacles	**62.5%** **(n = 25)**	**10.6%** **(n = 9)**
Psychological distress	**82.5%** **(n = 33)**	**30.6%** **(n = 26)**
History of diagnosed mental illness	**70.0%** **(n = 28)**	**27.1%** **(n = 23)**
Victim of bullying as a child/adolescent	30.0% (n = 12)	3.5% (n = 3)
Self-aggrandisement/over confidence	37.5% (n = 15)	7.1% (n = 6)
Lived alone at the time of radicalisation	40.0% (n = 16)	12.9% (n = 11)
Victim of physical abuse as a child	15.0% (n = 6)	1.2% (n = 1)
History of thrill- or sensation-seeking behaviours	47.5% (n = 19)	21.2% (n = 18)
Process of religious conversion	32.5% (n = 13)	11.8% (n = 10)
History of self-isolation/social withdrawal	67.5% (n = 27)	41.2% (n = 35)
Chronic stress	47.5% (n = 19)	23.5% (n = 20)
Prior to first exposure, there was a situation of crisis	70.0% (n = 28)	47.1% (n = 40)
Substance abuse	40.0% (n = 16)	20.0% (n = 17)
Pattern of violence through childhood/adolescents	17.5% (n = 7)	4.7% (n = 4)
Required special attention/care as a child	12.6% (n = 5)	3.5% (n = 3)
Perpetrator of domestic abuse	17.5% (n = 7)	7.1% (n = 6)
University experience	47.7% (n = 19)	29.6% (n = 25)
Raised in a religious household	42.5% (n = 17)	32.9% (n = 28)

First radicalising encounter took place online	22.5% (n = 9)	17.6% (n = 15)
First espoused violent extremist ideology in prison	5.0% (n = 2)	5.9% (n = 5)
Previous criminal convictions	52.3% (n = 21)	46.9% (n = 40)

The unstable cluster is characterised by high frequencies of indicators that, when used as proxies, may indicate cognitive susceptibility traditionally associated with persistent offending and other behavioural problems (Robbins & Bryan, 2004; Steinberg et al., 2008; Wikström & Treiber, 2016; Windle, 1991). The most salient features of this cluster are impulsivity (85%), difficulties with anger management (80%), an inflexibility or inability to adapt to challenges (62.5%), psychological distress (82.5%), and diagnosed mental illness (70%). This cluster suggests a pattern of instability, including a history of childhood and/or adolescent violence (17.5%), domestic abuse (17.5%), and social isolation (67.5%).

The stable cluster is characterised by lower frequencies of these indicators, although 37% of these offenders had a diagnosed mental illness and 30.6% demonstrated psychological distress. The label 'stable' refers to the pattern of indicators *relative* to the unstable cluster. I do not suggest that these offenders are 'stable.' Frequencies of co-occurring developmental issues, cognitive vulnerabilities, social isolation, and historical violence are significantly lower compared to the unstable cluster.

3.4.2 Situation

Cluster analysis of the situation component detected three clusters (see Table 3.2). These were labelled *low leakage low stress* (n = 28), *high leakage high stress* (n = 36), and *high leakage low stress* (n = 61). The silhouette measure of cohesion and separation was .2, which is fair.

Table 3.2. Prevalence of situation variables by cluster.

Situation variables	Clusters		
	Low leakage low stress (n = 28)	High leakage high stress (n = 36)	High leakage low stress (n = 61)
Others aware of their grievance	**10.7%** **(n = 3)**	91.7% (n = 33)	**93.4%** **(n = 57)**
Others aware of their extreme ideology	**7.1%**	86.1%	**86.9%**

	(n = 2)	(n = 31)	(n = 53)
Target of prejudice/unfairness	7.1%	**63.9%**	**6.6%**
	(n = 2)	**(n = 23)**	**(n = 4)**
Recently became unemployed	10.7%	**72.2%**	13.1%
	(n = 3)	**(n = 26)**	(n = 8)
Made verbal statements to friends	**0.0%**	83.3%	50.8%
	(n = 0)	(n = 30)	(n = 40)
Experienced being degraded	3.6%	**50.0%**	3.3%
	(n = 1)	**(n = 18)**	(n = 2)
Experienced financial problems	7.1%	**63.9%**	13.1%
	(n = 2)	**(n = 23)**	(n = 8)
Expressed a desire to hurt others	**17.9%**	69.4%	**82.0%**
	(n = 5)	(n = 25)	**(n = 50)**
Experienced being disrespected	10.7%	**55.6%**	**6.6%**
	(n = 3)	**(n = 20)**	**(n = 4)**
Produced letters/public statements	**10.7%**	66.7%	75.4%
	(n = 3)	(n = 24)	(n = 46)
Made verbal statements to the public	0.0%	63.9%	54.1%
	(n = 0)	(n = 23)	(n = 33)
Experienced being ignored by someone	3.6%	30.6%	0.0%
	(n = 1)	(n = 11)	(n = 0)
Angry	21.4%	72.2%	62.3%
	(n = 6)	(n = 26)	(n = 38)
Anger was escalating	0.0%	61.1%	36.1%
	(n = 0)	(n = 22)	(n = 22)
Evidence of a recent stressor	14.3%	61.1%	26.2%
	(n = 4)	(n = 22)	(n = 16)
Experienced not being cared for	3.6%	27.8%	3.3%
	(n = 2)	(n = 10)	(n = 2)
Changed address	42.9%	83.3%	45.9%
	(n = 12)	(n = 30)	(n = 28)
Experienced a work stressor	17.9%	41.7%	11.5%
	(n = 5)	(n = 15)	(n = 7)
Evidence of bomb manuals found	53.6%	16.7%	49.2%
	(n = 15)	(n = 6)	(n = 30)
Experienced being a helpless victim	7.1%	27.8%	4.9%
	(n = 2)	(n = 10)	(n = 30)
Victim of physical/verbal assault	7.1%	27.8%	4.9%
	(n = 2)	(n = 10)	(n = 3)
Interrupted in pursuing proximate life goal	10.7%	27.8%	4.9%
	(n = 3)	(n = 10)	(n = 3)
Problematic personal relationships	7.1%	41.7%	27.9%
	(n = 2)	(n = 15)	(n = 17)
Proximate upcoming life change	14.3%	22.2%	3.3%
	(n = 4)	(n = 8)	(n = 2)
Underwent online training	32.1%	36.1%	59.0%
	(n = 9)	(n = 13)	(n = 36)
Underwent hands-on training	7.1%	36.1%	21.3%
	(n = 2)	(n = 13)	(n = 13)
Gave a direct event warning	3.6%	25.0%	29.5%

	(n = 1)	(n = 9)	(n = 18)
Engaged in dry-runs	7.1%	33.3%	32.8%
	(n = 2)	(n = 12)	(n = 20)
Denounced others who share their beliefs	0.0%	19.4%	14.8%
	(n = 0)	(n = 7)	(n = 9)
Travelled for preparatory activities	14.3%	38.9%	19.7%
	(n = 4)	(n = 14)	(n = 12)
Un-related violence, pre-attack	35.7%	30.6%	50.8%
	(n = 10)	(n = 11)	(n = 31)
Sought legitimisation from community	3.6%	19.4%	13.1%
	(n = 1)	(n = 7)	(n = 8)
Altered appearance	7.1%	16.7%	9.8%
	(n = 2)	(n = 6)	(n = 6)

These clusters are differentiated notably by the degree of leakage, the influence of situational stressors, and by indicators of a pre-existing propensity for violence. Leakage refers to the degree to which the offender told others of their intentions prior to the attack. High stress refers to a transitional period, characterised by a pattern of experiences such as encountering prejudice or unfairness, recent unemployment, being degraded or disrespected, and financial problems. The low leakage low stress cluster exhibit lower frequencies of leakage behaviours, as well as lower frequencies of situational stressors. These lone-actor terrorists demonstrate lower frequencies across all of the situation indicators. The most frequently occurring behaviours are change in address (42.9%), evidence of bomb-making manuals (53.6%), online training (32.2%), and unrelated (to their terrorist event) pre-attack violence (35.7%).

The high leakage high stress cluster demonstrate high frequencies of leakage behaviours and high frequencies across a number of situational stressors, including experiencing prejudice or unfairness (63.9%), recent unemployment (72.7%), experiencing being degraded (50%), financial problems (63.9%), being disrespected (55.6%), being ignored by someone important (30.6%), escalating anger (61.1%), and acute stress (61.1%). The high leakage low stress cluster exhibit high frequencies of leakage behaviours, low frequencies of stressors, and high frequencies of indicators of violent propensity. These

include a desire to hurt others (82%) and unrelated (to their terrorist event), pre-attack

violence (50.8%).

3.4.3 Exposure

Cluster analysis of the exposure component detected two clusters (see Table 3.3).

These are named *lone* (n = 78) and *connected* (n = 47). The silhouette measure of cohesion

and separation was .4, which is fair.

Table 3.3. Prevalence of exposure variables by cluster.

Exposure variables	Clusters	
	Lone	Connected
	(n = 78)	(n = 47)
Face-to-face interactions with members of a wider network	**9.0%** **(n = 7)**	**89.4%** **(n = 42)**
Claims to be a part of a wider group/movement	**21.8%** **(n = 16)**	**76.6%** **(n = 36)**
Member of a small militant/activist group at any point	**7.7%** **(n = 6)**	**53.2%** **(n = 25)**
Read literature/propaganda from a wider movement	**43.6%** **(n = 34)**	**93.6%** **(n = 44)**
Interacted virtually with members of a wider network	**14.1%** **(n = 11)**	**59.6%** **(n = 28)**
Evidence of command-and-control links with others in this event	0.0% (n = 0)	25.5% (n = 12)
Individual tried to recruit others/form a group prior to the event	6.4% (n = 5)	40.4% (n = 19)
Individual ever rejected from a group prior to the event	1.3% (n = 1)	21.3% (n = 10)
Others knew about the research/planning prior to the event	24.4% (n = 19)	27.7% (n = 13)
The individual's spouse/partner was part of a wider movement	1.3% (n = 1)	12.8% (n = 40)
Others involved in procuring the weaponry/technology	10.3% (n = 8)	27.7% (n = 6)
Evidence of reading the propaganda of other lone-actor terrorists	11.5% (n = 9)	25.5% (n = 12)
Evidence of reading literature/materials of other lone-actor events	20.5% (n = 16)	36.2% (n = 17)
Other individuals were involved in the assembly of IED's	9.0% (n = 7)	10.6% (n = 5)

The connected cluster demonstrates higher frequencies of behaviours that indicate ties to other extremists. Over 66% of actors in the connected cluster claimed to be part of a wider movement and 25.5% showed evidence of direct command-and-control links. In contrast, the lone cluster demonstrates lower frequencies of these indicators. Nine percent of these lone-actor terrorists had face-to-face interactions with members of a wider network, and none showed any evidence of command-and-control links.

The second phase of the analytical strategy sought to identify patterns across the three components of the attack process. Bivariate analysis tested the strength of the association between the proposed components, (Cramer's V). Propensity was significantly associated with situation ($V = .24$, $p < .05$), which was significantly associated with exposure ($V = .38$, $p < .00$). Propensity was not significantly associated with exposure. This makes theoretical sense from the perspective of the RAF. Propensity would be a direct determinant of some of the indicators which make up the situation category (e.g. pre-attack violence) but would be more distantly related to exposure (through, for example, mediating selection effects).

A second cluster analysis was performed on cluster membership across the three components. The analysis detected four distinct PEPs: *the solitary PEP* ($n = 23$); *the susceptible PEP* ($n = 40$), *the situational PEP* ($n = 22$), and *the selection PEP* ($n = 40$) (see Table 3.4). The silhouette measure of cohesion and separation was .5, which is good.

Table 3.4. Prevalence of first stage cluster membership by second stage cluster membership.

Component PEP	Propensity	Situation	Exposure
Solitary (n = 23)	Stable (100%) (n = 23)	**Low leakage/ Low stress (100%) (n = 23)**	Lone (100%) (n = 23)
Susceptible (n = 40)	**Unstable (100%) (n = 40)**	High leakage/Low stress (52.5%) (n = 21) High leakage/High Stress (47.5%)	Lone (65%) (n = 26) Connected (35%)

		(n = 19)	(n = 14)
Situational (n = 22)	Stable (100%) (n = 22)	**High leakage/High crisis (95.5%) (n = 21)** **High leakage/Low stress (4.5%) (n = 1)**	Connected (54.5%) (n = 12) Lone (45.5%) (n = 10)
Selection (n = 40)	Stable (100%) (n = 40)	**High leakage/Low stress (100%) (n = 40)**	Connected (52.5%) (n = 21) Lone (47.5%) (n = 19)

The solitary PEP classified 18% of the sample (n = 23). These lone-actor terrorists are stable at the propensity component, low leakage low stress at the situation component, and lone at the exposure component. The susceptible PEP classified 32% of the sample (n = 40). These offenders are unstable at the propensity component, 47.5% were high leakage high stress and 52.5% were high leakage low stress at the situation component, 65% were lone and 35% were connected at the exposure component. The situational PEP classified 18% of the sample (n = 22). A hundred percent of these lone-actor terrorists were stable at the propensity component, 95.5% were high leakage high stress and 4.5% were high leakage low stress at the situation component. These offenders were marginally more frequently connected (52.4%) than lone (47.6%) at the exposure component. The selection PEP classified 32% of the sample (n = 48). These lone-actor terrorists were stable at the propensity component, high leakage low crisis at the situation component, and both lone (47.5%) and connected (52.5%) at the exposure component.

3.5 Discussion

The present study identified four PEPs in lone-actor terrorism. It is important to reiterate that the PEPs are not intended as a typology of 'types of people'; rather they represent how different individual-level characteristics, notably those which are propensity-related, interact with situational and exposure factors to result in violent extremist action.

First, to further interpret the meaning of the PEPs, the results are discussed with guidance from the RAF. Second, the practical implications of these findings are discussed.

3.5.1 The solitary PEP

This PEP would seem to lack a salient pattern of common indicators of a propensity to pursue terrorist violence. This style of interaction was classified as stable, low leakage low stress, and lone. Yet at some point, these 23 lone-actor terrorists became motivated to commit acts of violence. When interpreting this cluster it should be noted, first, that the clusters are not absolute types. For example, the lone cluster is lone *relative* to the connected cluster. Few of the indicators occur at frequencies of zero, and so it is possible that this particular analytical approach has overlooked a subtler style of interaction. For instance, 14% of the low leakage low stress cluster did in fact experience a recent stressor in the build-up to an attack. Therefore, it is not to say that the solitary PEP characterises a style of interaction that is undetectable or devoid of any indicators of risk. Rather, the causal mechanisms sustaining this trajectory have likely not been detected.

Second, the study was limited in its ability to operationalise interactions beyond the individual and situational levels. To operationalise some of these interactions, proxies that were not designed for this purpose were used. These were subject to the availability bias that characterises much of the data in this space (Dugan, 2011; Jongman, 1993; LaFree & Dugan, 2007, Safer-Lichtenstein et al., 2017). It is possible that interactions beyond these levels underlie more crucial causal mechanisms or that different proxies were required to detect propensity markers in these individuals, which due to availability are biased towards traditional cognitive or affective, rather than moral, indicators.

However, if valid, I may have identified a less commonly considered route to terrorism with specific implications for threat assessment. The most salient feature of this

style of interaction is the pattern of indicators that demonstrate low frequencies of leakage indicators and dynamic stressors. This could pose a unique challenge for the threat assessment of these offenders. For example, The Terrorist Radicalisation Assessment Protocol (TRAP-18) is an investigative framework for lone-actor terrorist threat assessment, utilised in the UK, US, and Canada. It consists of 8 proximal warning behaviours (pathway, fixation, identification, novel aggression, energy burst, leakage, last resort and directly communicated threat) and 10 distal characteristics (personal grievance, ideology, failure to affiliate, dependence on the virtual community, thwarting of goals, changes in thinking, failure of pair bonding, mental disorder, creativity and criminal violence) that distinguish between static and dynamic indicators of risk (Meloy & Gill, 2016). Yet the solitary PEP is broadly lacking in high frequencies of any of these proximal warning behaviours, bar some evidence of pathway warning behaviours and novel aggression.

Pathway warning behaviours include planning, preparation, and committing an attack, and are late-stage indicators of the risk of terrorist violence. As conceived in the TRAP-18, novel aggression is thought to be a way for lone-actor terrorists to test their resolve to commit violence, and likely occurs in the late stages of attack preparation. Here, the most salient indicators of mobilisation occur at the penultimate stages of the attack process. The window for detection is therefore likely much shorter, and the opportunities for detection more limited. To the extent that these offenders may be 'watched', there might be a danger that intelligence-gathering would not be escalated to active risk management, due to the low prevalence of dynamic risk indicators.

Likewise, the prevalence of leakage behaviours has been reported extensively throughout the literature, (Gill & Corner, 2016; Gill et al., 2014; Schuurman, Bakker et al., 2018) and is central to threat assessment (Meloy & Gill, 2016; Meloy, Mohandie, Knoll, & Hoffmann, 2015). The solitary PEP demonstrates much lower frequencies of these

behaviours and therefore it may be necessary for practitioners to consider a trajectory of warning behaviours absent of any leakage indicators as still posing a credible threat.

Lastly, this style of offending is characterised by low frequencies of relational ties to others. As previously discussed, the 'loneness' of lone-actor terrorists is often debated. However, these findings are comparable to previous research. For example, in a temporal and geospatial analysis of lone-actor terrorists, Smith, Gruenewald and Damphousse, (2015) disaggregated lone terrorists by their group affiliations and level of assistance in preparing for an attack. They reported that only 6% of their sample of 267 offenders were categorised as 'loners;' where loners had no group affiliations, no help committing and attack, and no help committing precursor acts. The solitary PEP, although not devoid of indicators that suggest connections to others, is comparable to Smith et al.'s (2015) loners, and so there is some support for considering the solitary PEP as a valid configuration.

To exemplify this style of interaction further, Figure 3.1 presents a behavioural sequence of Lors Doukaiev's pathway to attack; an offender from the present dataset of lone-actor terrorists.

Figure 3.1. A behavioural sequence of an offender who demonstrates the solitary PEP style of interaction: Lors Doukaiev
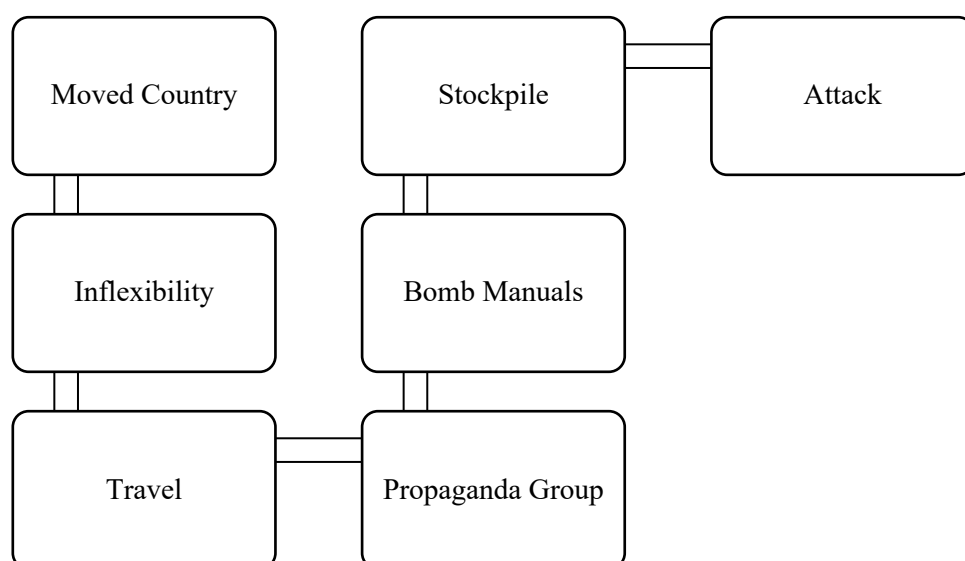
This sequence demonstrates a trajectory absent of many of the common indicators associated with the risk of lone violent extremism. There is some evidence of pathway warning behaviours, such as gathering bomb manuals and stockpiling weapons. However as discussed, this likely occurs in the penultimate stages of attack planning and therefore does not allow a substantial window for detection. It could be suggested that detection in this instance was possible, had the relevant agencies received and actioned the appropriate intelligence. However, it could equally be argued that, on the basis of this behavioural sequence, that there was little evidence in the first instance to warrant the active risk management of this offender. Arguably, further investigation is required to facilitate a deeper understanding of this style of interaction.

3.5.2 The susceptible PEP

The susceptible PEP suggests a route to lone-actor terrorism characterised most saliently by a pattern of instability at the propensity component. Here, cognitive susceptibility indicators suggest a relative level of vulnerability. Social- and self-selection factors may lead to sustained exposure to radicalising settings and the eventual development of a terrorist propensity and/or of the motivation to commit an act of terrorism. This particular configuration resonates with crime and delinquency research. Previous work has identified an association between impairments in executive functioning, specifically low self-control, and exposure to criminogenic environments in the internalisation of antisocial moral norms, and in the emergence of criminal motivation (Pratt, 2015).

In the terrorism field, previous research has reported elevated rates of mental disorders in lone-actor terrorists versus group actors (Corner & Gill, 2015; Fein & Vossekuil, 1999; Gill et al., 2014; Gruenewald et al., 2013a; Gruenewald, Chermak, & Freilich, 2013b;

Hewitt, 2003; Liem et al., 2018). However, these findings are aggregated. Disaggregating the dataset, the unstable cluster presents a profile of lone-actor terrorists whereby 70% had at least one diagnosed mental illness and 82.5% exhibited signs of psychological distress. All of the lone-actor terrorists classified along the susceptible PEP are unstable at the propensity component. However, it should be noted that Corner et al. (2019) examined the multifinality of a number of behavioural indicators in this dataset and demonstrated how different indicators play different roles at different times in trajectories to lone-actor terrorism.

The susceptible PEP suggests a style of interaction whereby cognitive susceptibility, in the form of mental illness, is a key factor in the emergence of the propensity and/or the motivation to commit a violent terrorist attack. A comorbidity of impulsivity, violence, and psychiatric disorder is widely reported, (Bjørkly, 2013; Chamorro et al., 2012). Meloy and Pollard (2017; 1) have also discussed the role of impulsivity in lone-actor terrorism, where they note the "pathway became a runway," as impulsivity seemed to prompt an irrational, premature attack despite careful planning and preparation in a number of case studies. Therefore, this style of interaction may pose a very different challenge to threat assessment.

An offender who exhibits impulsivity and psychiatric disorder may progress from radicalisation to violent attack more rapidly than would otherwise be expected. The RAF's interactive logic suggests an inverse relationship between susceptibility and exposure (i.e. the higher the susceptibility, the lower the exposure required for propensity change). Hence, the susceptible PEP could characterise someone who 'radicalises quickly', making these offenders more difficult to detect. Although, an offender characterised by this degree of psychiatric disorder is likely to come into contact with mental health practitioners, providing an early opportunity for intervention. This suggests that mental health practitioners can play a key role in the threat assessment of lone targeted violence (Weine, Eisenman, Jackson, Kinsler, & Polutnik, 2017). In other words, a better understanding of *how* mental illness

interacts with other individual susceptibility and situational factors could help inform policy makers, analysts and practitioners, to devise more effective, targeted intervention.

Interestingly, the fact that most of these offenders are classified as lone (65%) may provide further evidence for the notion of selection effects in lone-actor terrorists with mental health issues. Organised terrorist groups seek recruits who can contribute to the operational success of the group and so those affected by mental illness may be less likely to be targeted. This selection effect may account for the elevated rates of mental illness observed in lone-actor terrorist populations and is further evidenced here (Corner et al., 2016). Relational analyses of radicalisation have also shown that 'loneness' is not always a choice, but that individual characteristics affect the actors' ability to form and maintain relationships with others in an extremist milieu (Malthaner & Lindekilde, 2017).

Furthermore, lone-actor terrorists classified by this PEP are equally high leakage high stress and high leakage low stress. This could be interpreted as further evidence that the locus of action stems from the propensity component. The patterns of behaviour observed at subsequent phases of the attack process varies from case to case but seem to originate from a core cognitive susceptibility. Figure 3.2 exemplifies a behavioural sequence as described by the susceptible PEP.

Figure 3.2. A behavioural sequence of an offender who demonstrates the susceptible PEP style of interaction: Frederique de Jongh

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┌──────────────┐   ┌──────────────┐   ┌──────────────┐   ┌──────────────┐   ┌──────────────┐
│              │   │ Problematic  │   │              │   │              │   │ Expressed    │
│ Support Child│   │ Personal     │═══│    Crisis    │   │   Leakage    │═══│ Desire To    │
│              │   │ Relationships│   │              │   │              │   │ Hurt Others  │
└──────┬───────┘   └──────┬───────┘   └──────┬───────┘   └──────┬───────┘   └──────┬───────┘
┌──────┴───────┐   ┌──────┴───────┐   ┌──────┴───────┐   ┌──────┴───────┐   ┌──────┴───────┐
│    Psych     │   │              │   │    Mental    │   │ Expressed    │   │              │
│   Distress   │   │Self Isolation│   │   Illness    │   │ Desire To    │   │    Attack    │
│              │   │              │   │              │   │ Hurt Others  │   │              │
└──────┬───────┘   └──────┬───────┘   └──────┬───────┘   └──────┬───────┘   └──────────────┘
┌──────┴───────┐   ┌──────┴───────┐   ┌──────┴───────┐   ┌──────┴───────┐
│              │   │              │   │              │   │              │
│ Low Control  │   │  Live Alone  │   │   Ideology   │   │   Leakage    │
│              │   │              │   │              │   │              │
└──────┬───────┘   └──────┬───────┘   └──────┬───────┘   └──────┬───────┘
┌──────┴───────┐   ┌──────┴───────┐   ┌──────┴───────┐   ┌──────┴───────┐
│              │   │   Address    │   │              │   │              │
│ Inflexibility│   │   Change     │   │   Injustice  │   │ Tipping Point│
│              │   │              │   │              │   │              │
└──────┬───────┘   └──────┬───────┘   └──────┬───────┘   └──────┬───────┘
┌──────┴───────┐   ┌──────┴───────┐   ┌──────┴───────┐   ┌──────┴───────┐
│ Problematic  │   │              │   │   Helpless   │   │              │
│ Personal     │   │  Unemployed  │   │    Victim    │   │    Stress    │
│ Relationships│   │              │   │              │   │              │
└──────┬───────┘   └──────┬───────┘   └──────┬───────┘   └──────┬───────┘
┌──────┴───────┐   ┌──────┴───────┐   ┌──────┴───────┐   ┌──────┴───────┐
│              │   │  Worsening   │   │              │   │  Escalating  │
│   Divorced   │═══│ Performance  │   │    Anger     │═══│    Anger     │
│              │   │              │   │              │   │              │
└──────────────┘   └──────────────┘   └──────────────┘   └──────────────┘
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The sequence illustrates the trajectory of convicted terrorist, Frederique de Jongh. First, there is evidence of a distal cognitive susceptibility, dominated by mental health issues, which precedes the adoption of an extremist ideology. As suggested by this PEP, the observable, pervasive pattern of indicators relating to impaired executive functioning is likely a key factor in the emergence of the motivation to commit a violent attack. Second, de Jongh, as described by the susceptible PEP, leaked his intent in the build-up to the attack. An intelligence analyst who had information relating to de Jongh's propensity for terrorist violence (relating to impaired executive functioning), alongside evidence of leakage behaviours, potentially could have identified a legitimate threat here.

3.5.3 The situational PEP

The most salient interaction of the situational PEP is the pattern of situational stressors observed at the situation component. The role of stress exposure in criminal offending is well-established and often debated with reference to General Strain Theory (GST); a life-course theory which conceives of crime and terrorism as an outcome of exposure to various strains (Agnew, 2010; Agnew & White, 1992; Eitle & Turner, 2003). In the context of lone-actor terrorism and as suggested by the RAF, the effects of stress are likely to be multifinal (Corner et al., 2019). Sixty-four percent of the sample experienced prejudice or unfairness alongside other dynamic stressors such as financial problems, unemployment, and being disrespected. While such experiences can be interpreted as motivational, in an interactionist framework they could also contribute to exposure. For example, anger at experiences of discrimination may lead to involvement in a civil organisation which happens be connected to a social network containing a radicalising agent, or, unemployment may lead to relocation to a neighbourhood where an extremist organisation is active.

The situational PEP is characterised as stable at the propensity component, and so may not attract attention early in the event process. However, there may be an opportunity to intervene in the build-up to an attack, as high frequencies of leakage behaviours occur alongside a pattern of multiple dynamic stressors. Vossekuil, Fein, and Berglund (2015) observed that over half of a sample of individuals involved in an attack or attempted attack on US public figures, had difficulty coping with dynamic stressors in the build-up to their offence. They suggested that threat assessment inquiries attend to patterns of dynamic stressors, the feelings these stressors invoke (e.g. desperation), and a person's coping mechanisms. Silver, Horgan & Gill (2019) identified findings similar to the situational PEP when examining the role of strain (in the context of Cumulative Strain Theory), across the

trajectories of mass murderers and lone-actor terrorist offenders. Hence, there is evidence to suggest the situational PEP as a legitimate route to lone-actor terrorist violence.

The TRAP-18 describes the proximal warning behaviour, last resort, as evidence of impending violent action, signalled by desperation or distress. Experiencing multiple dynamic stressors may trigger last resort thinking and signal an acceleration towards violent action. Subjects of interest being 'watched' who demonstrate this pattern of dynamic stressors may warrant escalation to active risk management in light of these findings. The situational PEP suggests that detecting and addressing stress and poor coping skills, among other factors, may be a valid approach to the risk management of some lone-actor terrorists. Figure 3.3 exemplifies a behavioural sequence as described by the situational PEP. The sequence details the trajectory of Jim David Adkisson.

Figure 3.3 A behavioural sequence of an offender who demonstrates the situational PEP style of interaction: Jim David Adkisson
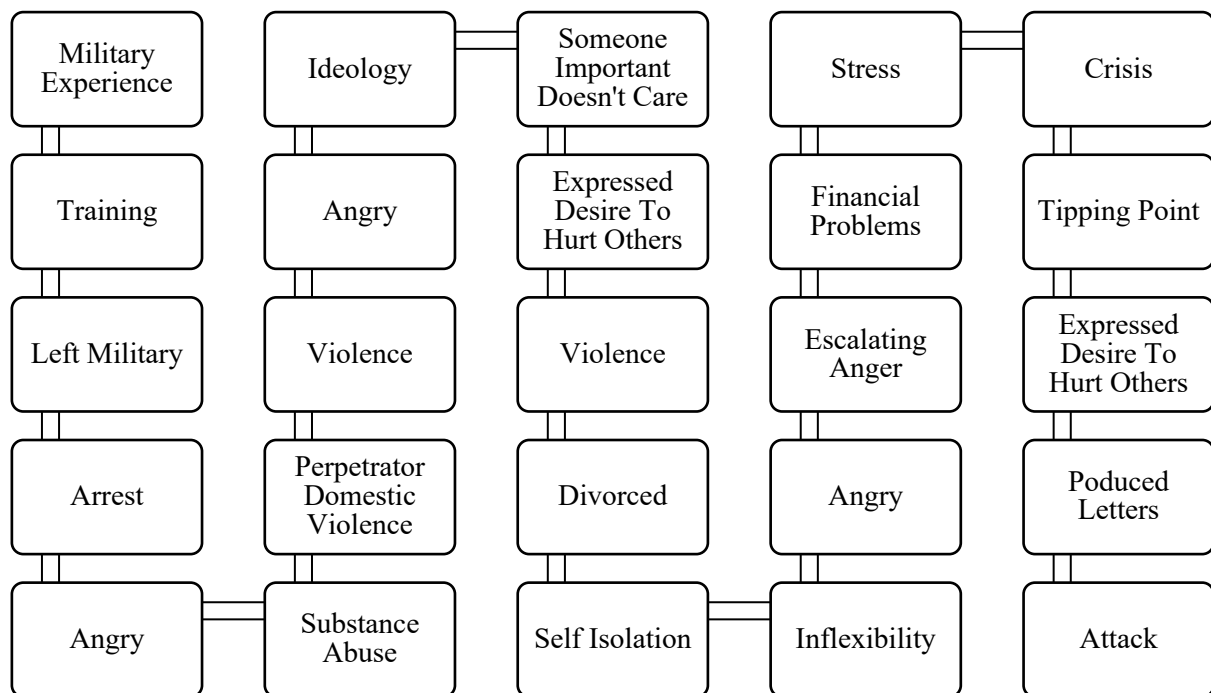
Of note, prior to adopting an extremist ideology, Adkisson demonstrates a propensity for violence. In the build-up to the attack, and as suggested by the situational PEP, there is an observable pattern of dynamic stressors, alongside a number of leakage behaviours. Here, Adkisson's trajectory demonstrates how a pervasive pattern of strain could be a factor in the emergence of the motivation to commit a violent terrorist attack. This may warrant analysts attending to patterns of dynamic stressors, alongside other mobilisation indicators, to enhance the detection of offenders demonstrating the situational PEP.

3.5.4 The selection PEP

Finally, the selection PEP delineates a route to offending influenced chiefly by a crime- and violence-supportive propensity at the situation component. These offenders appear stable at the radicalisation component and espouse their grievances widely, with little evidence of dynamic stressors at the situation component. They are equally lone and connected but are characterised most distinctively by behaviours indicative of crime-supportive propensity at the situation component. This is in terms of the violence-supportive belief dimension of propensity, more than in terms of executive functioning, as seen in the susceptible PEP. This propensity may result in self-selection, as these offenders would have an increased preference for engaging with likeminded individuals in criminal and/or extremist settings. When provoked to action, this criminogenic propensity for violence in particular, makes the pursuit of violent action more likely.

This style of offending most resembles the predatory offender identified by typologies of a range of homicide offenders including anti-LGBT homicides (Fisher & Salfati, 2009; Tomsen, 2013, Kelley & Gruenewald, 2015) and mass murderers (Declercq & Audenaert, 2011; Meloy, 1997; Langman, 2009). Langman (2009) for instance, describes a three-category typology of rampage shooters; psychopathic, psychotic, and traumatised. The

psychopathic offender is characterised by narcissism, a lack of empathy, and sadism. The selection PEP demonstrates some of these traits with higher frequencies of violence unrelated to terrorism in the build-up to an attack, higher frequencies of espousing grievances widely, and higher frequencies of expressing a desire to hurt others.

The selection PEP could pose a different challenge to practitioners in terms of a potential offender's capability. Most of these lone-actor terrorists do not suffer from mental illness or other impairments of higher order functioning and are not experiencing a distress-invoking period of dynamic stress. Therefore, they may be more capable of carrying out a successful attack. In terms of threat assessment and management strategies, drawing from the experience of handling violent, personality disordered individuals, may be of benefit in terms of dealing with this particular PEP. These lone-actor terrorists expressed a desire to hurt others in over 80% of cases, demonstrated high frequencies of leakage behaviours, and half of them committed acts of violence unrelated to their attack in the build-up to the event. Therefore, it is likely that these offenders will be known to the community as dangerous individuals, as well as to other agencies, suggesting specific opportunities for detection and disruption.

Furthermore, the selection PEP is equally lone and connected at the exposure component, as is the situational PEP, suggesting that the locus of action is internal. Gill (2015a; 6) asked the question, 'Why go it alone?', which relates to a broader need to understand the differences between group actors and lone-actor terrorists. Perhaps an important difference between these categories of terrorists lies in the locus of action. The least salient feature of the PEPs is the exposure component. This could be taken as an indication that the behaviour of these lone-actor terrorists is more essentially self-sustained, compared to group actors who take direction from the collective.

Figure 3.4 exemplifies a behavioural sequence as described by the selection PEP. It illustrates the trajectory of Omar Adbel Hamid El-Hussein.

Figure 3.4. A behavioural sequence of an offender who demonstrates the selection PEP style of interaction: Omar Adbel Hamid El-Hussein

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┌──────────┐      ┌──────────┐      ┌──────────────┐
│ Arrested │      │ Adoption │══════│  Religiosity │
│          │      │          │      │  Intensifies │
└────┬─────┘      └────┬─────┘      └──────┬───────┘
     ║                 ║                   ║
┌────┴─────┐      ┌────┴─────┐      ┌──────┴───────┐
│  Verbal  │      │ Imprison │      │    Verbal    │
│Statements│      │          │      │  Statements  │
└────┬─────┘      └────┬─────┘      └──────┬───────┘
     ║                 ║                   ║
┌────┴─────┐      ┌────┴─────┐      ┌──────┴───────┐
│ Substance│      │ Drop Out │      │ Others Help  │
│  Abuse   │      │          │      │  Procuring   │
│          │      │          │      │   Weapons    │
└────┬─────┘      └────┬─────┘      └──────┬───────┘
     ║                 ║                   ║
┌────┴─────┐      ┌────┴─────┐      ┌──────┴───────┐   ┌────────┐
│ Violence │══════│ Arrested │      │  Stockpile   │═══│ Attack │
└──────────┘      └──────────┘      └──────────────┘   └────────┘
```

Figure 3.4. A behavioural sequence of an offender who demonstrates the selection PEP style of interaction: Omar Adbel Hamid El-Hussein
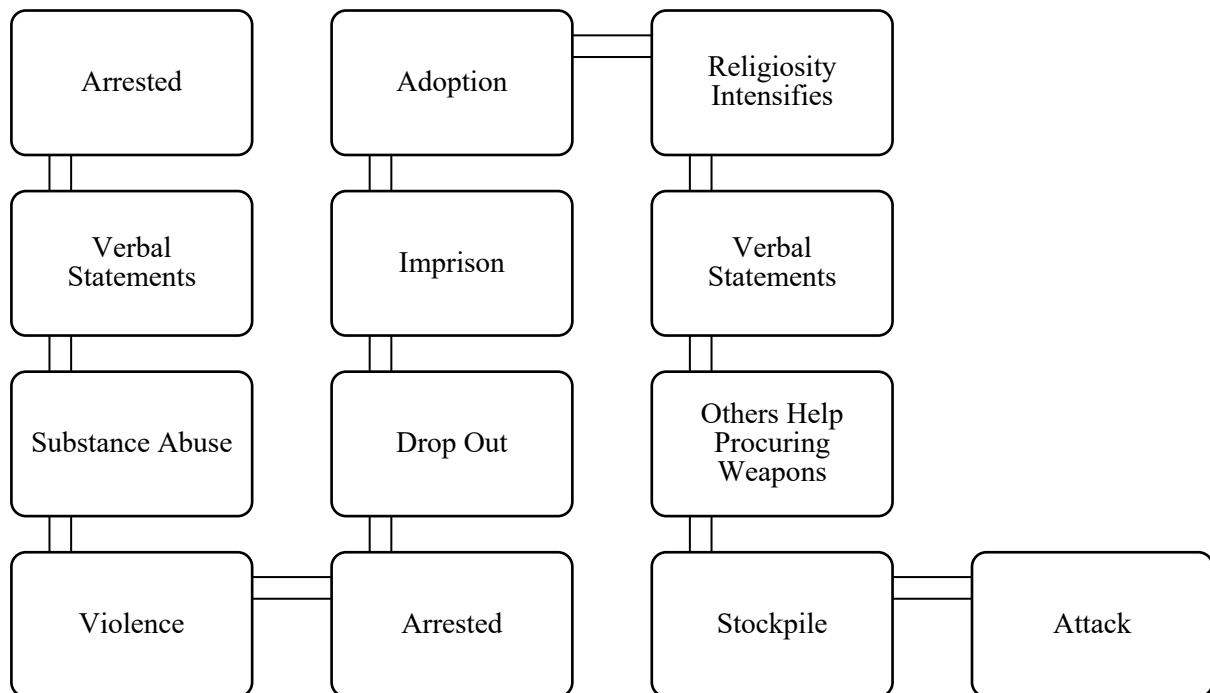
El-Hussein demonstrates a violence-and-crime supportive propensity, typical of the selection PEP, that precedes the adoption of an extremist ideology, including multiple arrests, a period of imprisonment, and acts of non-terrorist violence. Once radicalised, El-Hussein mobilises to attack preparation, leaking his intent, and seeking help from others to procure weapons.

3.5.5 Practical implications

The PEP typology has policy and practical implications for countering the lone-actor terrorist threat. In general, the lone-actor terrorist population has been shown to be heterogenous. This poses a unique challenge in itself. A typology, such as the PEP typology,

can be useful to policymakers when dealing with heterogenous populations as it can provide a framework for developing tailored responses as opposed to broad, generalised policies (Holt et al., 2019). For instance, the susceptible PEP demonstrates a style of interaction that may benefit from an intervention designed to address mental health needs. Whereas the situational PEP identifies a configuration of dynamic stressors where interventions should attend to an offender's stress response and coping skills. Conversely, the selection PEP may require a response more similar to the treatment of violent, personality disordered offenders, such as in general forensic populations. More specifically, this section discusses two key implications of the present findings. First, I discuss the implications of the PEP analysis with regard to the threat assessment of these offenders. Second, I propose suggestions for intelligence gathering and analysis, and conclude with commentary on the need to continue to pursue multiagency intelligence sharing.

3.5.5.1 Threat assessment

The current practice of lone-actor terrorist threat assessment is often carried out by utilising risk assessment tools. These tools aid decision-making by providing estimates of relative risk based on the prevalence of a range of risk indicators. These include the ERG22+ utilised by the UK government's PREVENT program (Lloyd & Dean, 2015), the Violent Extremism Risk Assessment (VERA-2) utilised in prisons and by probation services (Pressman, Duits, Rinne & Flockton, 2016), the IR46, a multiagency Dutch risk assessment tool used in policing, and the previously described TRAP-18 (Meloy & Gill, 2016). These tools are designed to help practitioners gauge an individual's risk of engaging in violent extremism. However, a static, indicator-orientated approach to risk assessment may be problematic given research that has demonstrated the instability and the multifinality of these indicators (Corner et al., 2019).

The case has been made that a structured professional judgement approach could be one way forward, in that it brings together consideration of indicators with experience- and theory-informed judgement within a structured clinical process (Logan & Lloyd, 2019; Monahan, 2012; 2015). However, this begs the question of the source of that structure. How is experiential and theoretical knowledge to be organised, systematised, and made communicable, generalisable, as well as testable, beyond the clinical or investigative case under consideration, and the ability of the individual analyst? How can general guidelines be formulated, if, as the earlier work of Corner et al. (2019) and the present PEP analysis suggests, risk indicators are context dependent to such an extent? An analytical framework, which clearly articulates the interaction processes between the individual and situational levels of explanation, such as the RAF, operationalised here, could provide the generalisable structure needed to inform professional judgements about lone-actor terrorism risk across ideological, temporal, and geographical contexts.

3.5.5.2 Intelligence gathering

To effectively counter the threat of lone-actor terrorism, intelligence is key. Community-level intelligence, as well as an efficient network of multiagency intelligence sharing, is vital to detect and disrupt this type of threat (Bettison, 2009; Brown, 2007, Carter & Chermak, 2012; Oliver, 2006, Nasser-Edine, Garnahm, Agostino & Caluya, 2011). McGarrell, Freilich and Chermak (2007) suggest that an ILP approach to counterterrorism is relevant as, first, these events are rarely spontaneous, and often involve a lengthy planning stage, and second, terrorism is often a local problem. In fact, Marchment, Bouhana and Gill (2018) demonstrated the distance-decay effect in a sample of lone-actor terrorists when examining the residence-to-attack journeys of this type of offender. Hence, the lone-actor terrorist threat is theoretically detectable, given the appropriate intelligence.

However, some have argued that law enforcement agencies have been overwhelmed with intelligence data (Carter & Chermak, 2012). A framework for guiding intelligence gathering may be of substantial benefit to counterterrorism policing. Frameworks such as the Nationwide Suspicious Activity Reporting (SAR) Initiative (NSIS, 2016; NSI, 2018) employed in the US by the Department of Homeland Security, the Intelligence Handling Model (IHM), and the Risk, Credibility, Actionability and Proportionality (RCAP) frameworks, employed by MI5 in the UK (Anderson, 2017), serve as a guide for collection, analysis and decision-making, based on suspicious behaviour data. The potential of frameworks such as the NSI to provide analysts with a tool for the risk assessment of terrorists has been demonstrated (Gruenewald et al., 2019). The present typology could serve as an additional framework for guiding the collection and analysis of intelligence data that relates to the emergence of the motivation to commit an attack.

The current practice of intelligence gathering is predominantly focussed on collecting observable, behavioural indicators that may signal mobilisation towards a terrorist attack. For example, the National Counterterrorism Center (NCTC) (2019) describes a framework of mobilisation indicators. These are grouped relative to their diagnosticity and include indicators such as 'preparing and disseminating a martyrdom,' 'communicating intent to engage in violent extremism,' and 'suspicious, unexplained, or unusual physical or weapons training.' Similarly, the Canadian Security Intelligence Service (2018), describes mobilisation indicators that broadly categorise travel preparations (for extremist purposes), changes in training and physical exercise routines, financial preparations, concealment or deceit, and final preparations such as making arrangements in the event of death.

Given the present findings, it may of benefit to consider the PEP typology as an additional framework for gathering intelligence relating to the emergence of the motivation to commit terrorist violence. This intelligence, alongside patterns of mobilisation indicators,

may be a more robust way to detect legitimate threats from a pool of watched subjects of interest (SOI), and better inform decision-making about the allocation of limited resources. The PEP typology disaggregates patterns of risk indicators and draws on the RAF to articulate the processes that these patterns allude to. However, by operationalising perceptible behaviours or experiences, I conserve the observability that existing intelligence-gathering frameworks depend upon. Hence, it is suggested that a) data collection should be expanded to include an analysis of propensity- and situation-relevant indicators, as outlined here, and b) analysis of this intelligence should focus on patterns of indicators, as outlined by the PEP typology, which may help signal motivation, alongside mobilisation.

Data relating to these indicators is likely to originate from a variety of sources. For instance, mental health practitioners are likely to have access to intelligence relating to the executive functioning of potential lone-actor terrorists. Whereas law enforcement agencies might have information on an offender's criminal history. Furthermore, members of the community may have intelligence related to situational stressors, leakage of intent, or exposure. Therefore, multi-agency intelligence sharing, across sectors and including community-level actors, will be key to successfully operationalising these findings.

Intelligence hubs such as the fusion centres in the US, the Integrated Security Units (ISUs) and the Integrated Threat Assessment Centre (ITAC) in Canada, as well as the safeguarding hubs that operate as part of the UK's PREVENT strategy, are central to such endeavours (Monaghan & Walby, 2010; Home Office, 2018; Pathé et al., 2018). However, in a review of information sharing among US law enforcement, government agencies, and private sector organisations, Carter (2015) found room for improvement. The findings of the present study provide further evidence to continue to advocate for enhanced, multiagency intelligence sharing, as the most robust tool in countering the lone-actor terrorist threat.

Specifically, the present study has implications for encouraging intelligence-sharing between mental health practitioners and police. For example, there are a number of existing collaborative police-mental health models designed to address the mental health facet of violent extremism. These include the previously described PREVENT strategy, the Netherlands National Police Threat Management Team, and the Queensland Fixated Threat Assessment Centre (QFTAC), modelled on the UK's Fixated Threat Assessment Centre (FTAC) (Pathé et al., 2018).

Within QFTAC, information is shared between the Queensland Police Service (QPS) and Queensland Health. Their Memorandum of Understanding (2016) sets out exemptions to the duty of confidentiality, based on the interests of public safety, that typically inhibits much of the intelligence sharing between these agencies. Given the result of the PEP analysis, specifically with reference to the susceptible PEP, there is cause to advocate further for the adoption of such models, and to legislate in such a way as to facilitate the intelligence-sharing between mental health agencies and police.

3.5.6 Limitations and future research

The present study is not without limitations which are important to reflect upon when considering the aforementioned practical implications. First, the data are open source. It is necessary to acknowledge the potential limitations of relying on secondary source data, over primary sources, such as direct assessments. Open source data has been criticised for having the potential to be unreliable, subject to bias, and incomplete (Spaaij & Hamm, 2015). Yet the nature of terrorists as a subject of study has required researchers to rely on secondary data collection methodologies in order to progress. As such, open source data has been the source of a range of important findings, as described in chapter 2. Robust data collection

methodologies and provisions to ensure inter coder reliability can mediate many of these concerns, as in the present study.

Second, much of the data in this space is characterised by missing data and biases with regards to the nature of what is missing (the availability bias). Safer-Lichtenstein et al. (2017) summarise this debate and conclude that researchers and policymakers should be transparent about the assumptions made about missing data and the effects of missing-values on policy recommendations (see also Crenshaw & LaFree, 2017). Given the nature of the data, there is likely to be some underreporting of certain types of indicators. For instance, as discussed with reference to the solitary PEP, the proxies necessary to detect the processes that underpin this trajectory were most likely unavailable. However, the present research does not rely upon single indicators to make causal statements. Rather it articulates assumptions, grounded in theory, based upon *patterns* of multiple indicators. Whilst certainly not exempt from the availability bias, this approach may be somewhat more resilient to its effects.

Third, the treatment of missing data. When relying on open source reporting it is sometimes difficult to decipher between missing data, and data that should be coded as 'no' or 'not present.' The authors of these sources, such as journalists, are unlikely to report at great length the absence of potentially infinite indicators that may be of interest to researchers (Gill et al., 2017). For instance, in the present dataset it was rare to encounter a definitive 'no' answer. This occurred most often in instances where corrections were printed in response to previous reporting errors. Hence, each variable in the analysis is treated dichotomously, where the response is either a 'yes' or not enough information to suggest a 'yes' and, therefore, a 'no.' Previous research on attempted assassinations of public figures, fatal school shootings, and targeted violence affecting higher education institutions and terrorism have employed similar strategies (Fein & Vossekuil, 1999; Gill et al., 2014; Gruenewald et al., 2013a; Vossekuil, 2002).

Lastly, cluster analysis is not temporal. The PEPs are not sequential and although it could be reasonably inferred that variables related to propensity may logically precede situational variables, there is no way to account for this with this model. Further research is needed to explore the way these behavioural interactions may evolve over time. It is also of interest to consider if the PEPs have implications for terrorist-decision making, including in target selection and attack style.

3.6 Conclusion

The present study applies a process perspective to lone-actor terrorist offending in an attempt to disaggregate this population alongside analytically coherent, but empirically-derived, dimensions. The findings reiterate the need to continue to progress away from static profiles of indicators and to pursue a more dynamic, dimensional approach, which, among other things, could help put to rest a contentious definitional debate (Borum et al., 2012). An alternative to absolute definitions of any criminal behaviour is to reconceptualise definitional elements as degrees along a continuum. As the present study demonstrates, lone-actor terrorists do not have to be defined wholly as *lone* or *connected* or *stable* or *unstable*, for example. Adopting a multi-dimensional approach can account for heterogeneity, while maintaining coherence within a general, well-articulated analytical framework. Such an approach would allow researchers and practitioners to progress beyond cyclical debates and engage in more productive discussions about different *styles of interaction*. Equally, these findings demonstrate the need to continue to disaggregate the offending population, even when considering sub-types of terrorists or events (Gill et al., 2014; Horgan & Morrison, 2011). Doing so has important implications for the study and threat assessment of the lone-actor terrorist, and quite likely group actors as well.

However, whilst the PEP typology certainly suggests configurations of risk factors which practitioners may attend to, it is still necessary to understand the prevalence of these factors in non-offending populations, and further, to consider how these configurations do (or do not) emerge among the general population. This may help speak to the *relevance* of pertinent risk factors. Hence the following chapters attempt to 'baseline' the findings presented here.

Chapter 4: The Base Rate Study: A test of survey questioning designs

Whilst chapter 3 demonstrates how patterns of risk factors may be more stable grounds for the risk and threat assessment of lone- (and quite likely other) actors, general population base rate estimates are necessary in order to better understand how offenders, or those vulnerable to offending, may be differentiated from those perhaps of less concern. Given the lack of previous research from which to draw, it is first necessary to explore how best to collect such data. Surveys are one way to generate base rates estimates, however relying on individuals to self-report sensitive attitudes or behaviours can be problematic. Two prominent approaches to consider are direct questioning designs, where subjects are asked sensitive items directly, and indirect questioning designs, where subjects do not signal their responses directly and may perceive greater anonymity, resulting in more truthful responses. Both have advantages and disadvantages. Given the relative novelty of the present work it is necessary to undertake a test of survey methods, here direct questioning, versus an indirect questioning design, the Unmatched Count Technique (UCT).

4.1 Introduction

As described in chapter 2, research on terrorism continues to progress (Schuurman, 2018). In fact, a systematic review of factors associated with individuals becoming violent extremists found 50 empirical articles (Desmarais et al., 2017). Studies typically cover areas concerning socio-demographic characteristics, criminal history, religion and spirituality, work and education, personal experiences, attitudes and beliefs, relationships, mental health, motivation, radicalising processes, and environmental factors (Desmarais et al., 2017). This empirical evolution spawned the development of a number of violent extremist risk assessment tools in the public domain including the ERG 22+, IR-46, Identifying Vulnerable People, Multi-Level Guidelines, TRAP-18, and the VERA-2R (Lloyd, 2019).

A consistent problem in both the study of engagement in violent extremism, and the subsequent implementation of violent extremist risk assessment, is that of base rates (Gill, 2015b). As far as I am aware, there has been no concerted attempt to explicitly measure how often these behaviours or experiences of interest occur in the general population. The same is largely true for general violent risk assessment research (Scurich & John, 2012), however, here, control group studies are much more prevalent. Control group studies are few and far between in violent extremist research. Indeed, Desmarais et al.'s (2017) systematic review found just six (Gottschalk & Gottschalk, 2004; Kavanagh, 2011; Krueger, 2008; Krueger & Malečková, 2003; Lee, 2011; Smith, 2008). Generalising results from research designs lacking adequate control or comparison groups, overpredicts engagement in violent extremism. This problem is compounded when we consider the relatively low occurrence of terrorism in the West (Sarma, 2017).

Generating general population base rates for predictors of violent extremist engagement will help develop more scientifically rigorous putative risk factors (Monahan, 2011), increase transparency in the provision of evidence (Smit et al., 2018), minimise potential bias in decision-making (Almazrouei et al., 2019), improve risk communication (Batastini et al., 2019), and allow for risk assessments based on Bayesian principles (Mokros et al., 2010; Harris & Rice, 2013). However *how* to develop base rates is an important concern. This poses a challenge as determining the prevalence rates of sensitive attitudes or behaviours is often problematic. In survey research, there are two prominent ways to address this; direct or indirect questioning. Given the absence of previous research to draw upon, it is necessary to first undertake a test of both. Hence the present study compares a direct questioning design with an indirect questioning design, UCT. Under the present study conditions, direct questioning seems the most suitable. The resultant base estimates as well as the full survey are hosted on the Open Science Framework, here.

4.2 Background

In the following section, I first briefly recap the risk indicator evidence base, reviewed in detail in chapter 2. Second, I outline the rationale for undertaking a test of survey methods.

4.2.1 Risk indicators

A substantial body of work now exists that examines risk factors and indicators for engagement in violent extremism, largely reviewed in chapter 2. LaFree et al. (2018) found support for variables related to social control, social learning, psychological perspectives, and previous criminality for political extremism in the US. A systematic review found some support for age, socioeconomic status, prior arrest, education, employment, relationship status, having a grievance, geographic locale, and type of geographic area, as factors associated with violent extremism (Desmarais, et al., 2017). Other systematic reviews, rapid evidence assessments, and research syntheses report similarly (Bouhana & Wikström, 2011; Lösel et al., 2018; McGilloway, Ghosh & Bhui., 2015; Monahan, 2012; 2016). Some studies moved beyond focussing on such distal risk factors and developed prevalence rates for a range of behaviour-based indicators (Gill et al., 2014). Further studies conceptualised such risk factors and indicators as relating to propensity, situation, and exposure, as in chapter 3 and also in Corner et al. (2019).

To briefly reiterate, propensity refers to developmentally relevant characteristics which may relate to a person's predisposition for engaging in future offending and is conceptualised as the outcome of the radicalisation process. Situational indicators relate to a person's environment, or situation. That is, a more proximate vulnerability, in contrast to propensity indicators. Exposure relates to encounters, online or offline, with people, places or settings which may promote extremist violence or an extremist morality. This may also serve

as a crude proxy measure for the prevalence of extremism in the general population. In the present study, I continue to conceptualise risk indicators as relating to propensity, situation, and exposure, based on analytical guidance from the aforementioned RAF.

Individual risk factors for engagement in violent extremism are important and inform the detection and disruption of terrorist threats. Notably, this body of knowledge has significant practical implications for the risk and threat assessment of violent extremism. Generating general population base rate estimates will have different implications for different approaches to risk assessment, i.e. actuarial versus structured professional judgement. I discuss this in more detail in the discussion. However, this knowledge is currently lacking and presents a significant gap in the terrorism literature. This drives the need to develop base rates.

4.2.2 Developing base rates

Determining the prevalence rates of sensitive attitudes or behaviours is challenging. Direct questioning requires participants to self-report or directly answer a series of items or questions. These include socially desirable items, such as voting, or pro-social attitudes, and socially undesirable items such as racism or homophobia. Measuring these can be subject to a number of biases and reporting errors, including underreporting of socially undesirable items, overreporting of socially desirable items, interviewer effects, bystander effects, and more (Krumpal, 2013; Tourangeau & Yan, 2007). There are two prominent ways to address this; direct or indirect questioning. I examine each in turn.

One factor in explaining the degree of misreporting is mode of delivery (see Gomes, Farrington, Maia & Krohn, 2019 for a systematic review). Interviewer-administered surveys, such as pencil-and-paper studies, or face-to-face interviews, can result in increased misreporting compared to self-administered surveys. In fact, empirical evidence suggests that

self-administered surveys may mediate the extent of many of these biases or effects (see Tourangeau & Yan, 2007 for a review).

Administering surveys online may mitigate these effects further by excluding the presence of an interviewer altogether (Duffy, Smith, Terhanian, & Bremer, 2005; Evans & Mathur, 2005). The results of studies that compare computer-assisted self-interview techniques to interviewer-administered questionnaires, equally suggest that limiting the presence of an interviewer may lessen the effects of these biases (Cooley, Miller, Gribble, & Turner, 2000; Gribble et al., 2000; Gribble, Miller, Rogers, & Turner, 1999).

Online surveys have a number of additional perceived advantages. These include a global reach, greater flexibility, speed and timeliness, the benefits of technological advances, convenience, ease of data entry and analysis, question diversity, low administration cost, ease of follow-up, controlled sampling, larger sample sizes (that are easier to obtain), control of answer order, control of missing data (via required responses), and built in 'go to' capabilities (e.g. if yes go to question 2, if no skip to question 3) to limit confusion and survey length (Evans & Mathur, 2005). In a comparison of pencil-and-paper and online surveys, Lonsdale, Hodge, and Rose (2006) noted online surveys increased response rates, resulted in less missing data, and garnered faster replies. Furthermore, in a comparison of online, anonymous, self-administered, and interviewer-administered surveys, the most effective mode of delivery was found to be an anonymous online survey (Robertson, Tran, Lewark, & Epstein, 2018). Hence there is reason to believe delivering a direct questionnaire anonymously, online may be the most appropriate, given the nature of the present study.

However, online surveys too have a number of limitations. For example, the skewed attributes of online populations, sample representativeness (or a lack thereof), subjects' lack of tech savviness, technological variations (desktop versus tablets versus mobile devices), unclear instructions, impersonality, privacy and security issues, and low response rates

(Evans & Mathur, 2005). Many of these limitations may be addressed by crowdsourcing samples via online panels.

Research has increasingly made use of online panels such as Amazon's Mechanical Turk (MTurk) (Palan & Schitter, 2018). Online panels, such as MTurk, are online platforms where users receive payment for their participation in research. Recently, a number of alternatives to MTurk have emerged, one being Prolific. Prolific differs from MTurk in that it was created for researchers in order to facilitate *academic* research. It is explained to users that they will be participating in academic research upon registration. Research comparing MTurk, Prolific, and CrowdFlower (CF) finds the latter twos' users more naïve and honest than MTurk users, a higher response rate yet higher rate of attention check failure in CF users, and that Prolific users produced data of comparable quality to MTurk's, and better than CF's (Peer, Brandimarte, Samat, & Acquisti, 2017).

Online panels are limited, however, in that they may be subject to a selection bias. More specifically, potential respondents are limited to those with internet access, and those who register as panel users. This excludes a fair proportion of the general public and samples may therefore be limited in their representativeness (Duffy et al., 2005). However, researchers who have predominantly relied on university student samples find online panels grant access to larger, more diverse samples than have traditionally been made available (Peer et al., 2017). Again, given the lack of previous research, it is necessary to consider an alternative approach to direct questioning.

Indirect questioning techniques emerged in response to the problematic nature of directly measuring sensitive items in survey research (Glynn, 2013). These include the Randomised Response Technique (RRT) (Warner, 1965), the Nominative Technique (Miller, 1985), the Group-answer Technique (Droitcour & Larson, 2002), the Diagonal Model (Groenitz, 2014), as well as others (see Nuno & John, 2015 for a summary). One such

technique is UCT (Dalton, Wimbush, & Daily, 1994; Wimbush & Dalton, 1997), also referred to as the Item Count Technique (Miller, 1984), or the List Item Technique (Kuklinski, Cobb, & Gilens, 1997), which I employ here.

The technique necessitates two groups: a control condition and a UCT condition. Instead of self-reporting potentially sensitive items, respondents are asked how many items in a list apply to them. The control condition receives sets of non-sensitive items. The UCT condition receives the same set of items, with the addition of one item of interest. The difference between the mean number of responses endorsed by each group is inferred to be attributable to the proportion of respondents in the UCT condition who endorse the sensitive item.

UCT assumes that subjects do not fully trust their anonymity when self-reporting sensitive items in direct surveys (and hence are subject to self-reporting biases). By introducing an additional layer of anonymity, subjects may perceive their anonymity to be more robust, and hence report more accurate estimates of sensitive items. The UCT protocol has evidenced higher estimates of base rates of sensitive items than direct surveys (Braithwaite, 2008; Dalton et al., 1994; Holbrook & Krosnick, 2009; Kuklinski et al., 1997; LaBrie & Earleywine, 2000; Nuno et al., 2013; Rayburn, Earleywine, & Davison, 2003; Sheppard & Earleywine, 2013; Tsuchiya, Hirai, & Ono, 2007; Wimbush & Dalton, 1997). Of particular relevance here, is that previous research finds support for using UCT to measure sensitive items in online surveys (in a comparison with RRT) (Coutts & Jann, 2011).

However, UCT is equally not without limitations. First, UCT requires relatively large sample sizes in order to be effective. Second, the protocol results in aggregate sample proportions rather than measures of the sensitive item for each respondent. This means that the data is not suitable for inferential testing such as regression modelling. This is a major limitation to consider although Blair and Imai (2012) and Glynn (2013) describe strategies

for conducting multivariate tests on responses derived from UCT questioning. Third, estimates are subject to sampling variance, particularly when utilising multiple control items. Lastly, UCT can be subject to ceiling, and near-ceiling effects (Glynn, 2013; Zigerell, 2011).

Ceiling effects occur when all test items apply to a participant. In this instance, a participant may perceive revealing their association with a test item through endorsing all of the items. Hence, they may underreport the number of items in order to conceal their association with the test item. Similarly, the converse may be true if they wish to associate themselves with a socially desirable item (Zigerell, 2011). This may also apply in cases where respondents endorse a high number of items, not necessarily all of them, resulting in a near-ceiling effect. For instance, if a sensitive item about engaging with extremism occurs in a set alongside three valid control items, the participant should select 'four' as their response. However, they may underreport the number of true list items (by one or two items) in order to clearly dissociate from the sensitive item.

Deflation (i.e. a negative estimate of the base rate of an item) may occur when subjects strongly wish to dissociate with a test item. In these instances, rather than underreporting by a single item, participants significantly underreport the number items. The mean difference between the control and UCT conditions would then be negative. The inverse may also be true where participants overreport to avoid *not* associating with a socially desirable test item. However, as described, UCT has been shown to be effective in yielding higher estimates of base rates of sensitive items. Given the sensitivity and social undesirability of many of the present items, it is important to consider indirect questioning methods, hence I employ UCT.

4.3 Method

4.3.1 Participants

Subjects were recruited via the online panel, Prolific. Prolific maintains a pool of approved subjects (approximately 70,000 persons) who register online to participate in academic studies in exchange for payment. Subjects are vetted and quality controlled via a scoring and reporting feature. For example, a participant who clicks through a survey without reading the questions or fails several attention checks can be reported to Prolific, have their submission rejected (without payment), or both. This will also affect their Prolific 'score' which is available to researchers upon review.

In order to participate in the study, subjects were required to give informed consent. Participants were able to withdraw their consent at any point during the survey. In these instances, subject's data were marked as 'returned' and they were excluded from data collection. Their place in the study was reallocated to another potential subject until the study quota was met. Seventy-three participants 'returned' their submissions. A further 40 participants failed to complete the study, and thus their data was not retained.

Given the nature of the subject pool and to control for possible inattention, three attention checks were included (Oppenheimer, Meyvis, & Davidenko, 2009). Some evidence suggests that excluding participants solely on the basis of a single attention check failure may result in bias (Anduiza & Galais, 2016; Berinsky, Margolis, & Sances, 2014; Hauser, Sunderrajan, Natarajan, & Schwarz, 2016; Miller & Baker-Prewitt, 2009). Hence, subjects who failed an attention check were escalated to a manual review of their data.

In review, I examined the length of time a subject spent completing the questionnaire, the pattern of their responses (i.e. for scale items, was the same answer selected for every question?) and whether they failed any other attention checks. Upon review of all of these factors, a decision was made about whether to reject or accept a submission. Upon rejection, participants received a message detailing why their response was rejected and were invited to query their rejection should they feel it unfounded. Their place in the study was automatically

reassigned to another suitable subject from the pool until the study quota had been met. Based on these exclusion criteria, 42 submissions were rejected. The final sample size was 2,108. Participants ranged from 18 to 50 years of age, with a mean age of 30.06 years (SD = 8.43). The sample included 1,158 (54.9%) females and 950 (45.1%) males. Of these, 52.1% were residing in the UK, 28.4% in the US, and 19.5% in Western Europe.

Participants were randomly assigned via a Qualtrics randomiser to one of three conditions: (1) direct survey, (2) UCT control, or (3) UCT treatment. The full survey is hosted on the Open Science Framework, here. The groups were equally distributed, however there were small differences in the size of each group. Wimbush and Dalton (1997) suggest that with sufficient sample size and random assignment, moderate differences in sample size should not impact upon outcomes. Importantly, there were no significant differences in the demographics of the groups (see Table 4.1). Either analysis of variance or chi square tests, where appropriate, assessed group differences. Hence, any differences between the groups should be attributable to the UCT manipulation, rather than inherent differences between the groups.

Table 4.1. Sociodemographic descriptive statistics for all conditions

	Conventional survey (*n* = 706)	UCT Control (*n* = 703)	UCT Treatment (*n* = 699)	p value
Age (in years)	29.91	29.91	30.34	.55
Sex				.60
Male	46.60%	44.40%	44.00%	
Female	53.40%	55.60%	55.60%	
Socioeconomic status*	5.29	5.10	5.14	.09
Current place of residence				.62
UK	50.70%	50.90%	54.40%	
USA	30.20%	27.60%	27.20%	
Western Europe	19.10%	21.50%	18.40%	
Highest education level				.34
No formal qualifications	1.60%	1.70%	1.70%	
Secondary school/GCSE	15.40%	16.90%	18.10%	
College/A Levels	26.90%	30.90%	28.20%	
Undergraduate degree	35.60%	33.90%	30.90%	

	Graduate degree	18.10%	13.80%	17.70%	
	Doctorate degree	2.30%	2.80%	3.05%	
	Prefer not to say	0.10%	0.00%	0.00%	
Employment status					.70
	Full-time	44.10%	44.40%	47.70%	
	Part-time	20.80%	19.80%	18.80%	
	Due to start a new job	2.10%	3.00%	2.80%	
	Unemployed/job-seeking	14.00%	14.50%	13.40%	
	Not in paid work	9.50%	8.80%	9.80%	
	Other	9.50%	9.50%	7.00%	
	Prefer not to say	0.00%	0.00%	0.00%	
Marital status					.20
	Single	35.30%	36.10%	32.50%	
	In a relationship	33.10%	38.10%	36.20%	
	Married	27.80%	22.20%	27.60%	
	Separated	1.30%	0.30%	1.00%	
	Divorced	1.30%	1.70%	1.40%	
	Widowed	0.30%	0.40%	0.10%	
	Never married	1.00%	1.10%	0.70%	
	Prefer not to say	0.00%	0.00%	0.00%	

* measured using the Macarthur scale of subjective social status (Adler & Stewart, 2007)

4.3.2 Measures

All measures were drawn from the codebook used to collate the dataset of lone-actor terrorists described in the previous chapter (Gill et al., 2014). The codebook was drawn from the wider literature and included over 200 risk factors and indicators associated with engagement in violent extremism. All variables from the lone-actor terrorist codebook that did not refer directly to committing terrorist offences (e.g. preparing explosive devices for an attack) were translated to survey items. Exceptions were items which called for temporal sequencing (as this was not within the scope of the present study) or in-depth elaborations (i.e. details of multiple prior arrests). Hence the survey is collated from all observable behavioural indicators from the codebook. This is both in order to generate base rates estimates of pertinent correlates of violent extremism, as well as to facilitate direct comparison with previously collected lone-actor terrorist dataset.

Participants first answered questions relating to their life experiences, attitudes, and any behaviours of interest that they may have witnessed. Situational variables were coded as present in the codebook if they occurred 'in the build-up to an attack.' In the general population sample, participants were asked to report if a situational stressor occurred 'during the past year.' This was in order to mirror the data collated by the lone-actor terrorist codebook and to capture experiences of acute stress, rather than occurrence of stressors over a lifetime. Attitudinal items and psychological constructs derived from the codebook and reported as absent/present were not self-reported here, given the inherent bias of doing so. Instead, these items were measured with pre-existing scale items.

Impulsivity was measured with five statements drawn from items used and developed by Grasmick, Tittle, Bursik, and Arneklev (1993) ('When I am angry, other people better stay away from me,' 'I lose my temper pretty easily,' 'I often act on the spur of the moment without stopping to think,' 'I often get into trouble because I act without thinking,' 'I never think about what will happen to me in the future'). Thrill-seeking was measured with three items ('I often do things without thinking of the consequences,' 'Sometimes I will take a risk just for the fun of it,' 'I sometimes find it exciting to do things that might be dangerous') (Pauwels & Swanson, 2017). Overconfidence/grandiosity was measured with two items derived from Peters, Joseph, Day, and Garety's (2004) 21-item Delusions Inventory ('I am destined to be someone very important,' 'I am very special'). All scale items were scored along a seven-point Likert scale ranging from 'strongly agree' to 'strongly disagree'.

Thrill-seeking, self-control, and overconfidence/grandiosity were dichotomised post data collection. First, Cronbach's alpha was calculated for each scale: thrill-seeking ($\alpha = .76$), impulsivity ($\alpha = .81$), overconfidence/grandiosity ($\alpha = .84$). Second, a mean score was calculated for each participant. Lastly, scores were dichotomised by converting scores of < 4 (i.e. 'strongly agree,' 'somewhat agree,' 'sort of agree' on the Likert scale) to present, and all

other values to absent. This reflects the coding of the lone-actor terrorist data who were deemed to demonstrate evidence of the trait (present) or not (absent).

Three items inspired by the VERA-2R (Pressman et al., 2016), conceptualised as protective factors, were included. Protective factors are sometimes included in the assessment of violent risk as factors which may mitigate the likelihood of future violence. These were 'community support for non-violence,' 'family support for non-violence,' and 'rejection of violence to obtain goals.' These items were translated for use with a general population sample. For example, the item 'community support for non-violence' specifically relates to violent extremism in the VERA-2R. Rather, I asked 'does your community disapprove of others committing acts of violence?' This is an approximation of a protective factor inspired by the VERA-2R but does not measure precisely the same information. The first two items were measured as dichotomous yes/no items to reflect the coding of the VERA-2R. The latter, an attitudinal item, was recorded along a 7-point Likert scale from 'strongly agree' to 'strongly disagree' ('It is OK to use violence to achieve my goals'). As above, this item was dichotomised by converting scores of < 4 to present, and all other values to absent.

4.3.3 Direct questioning

All items from the lone-actor terrorist codebook deemed sensitive were presented as a traditional self-report survey. Indicators relating to exposure were translated directly from the lone-actor terrorist codebook. Additionally, the codebook includes items that measure leakage. These items were translated to measure the extent to which the general population may have *witnessed* leakage behaviours. For example, 'Have you ever witnessed someone make verbal statements in support of a violent ideology?' was translated from the codebook item 'Did the individual make verbal statements in the build up to their attack?' These items may serve as a further proxy for exposure to extremism in the general population.

4.3.4 Indirect questioning (UCT)

As in the direct survey, all subjects first answered questions relating to their life experiences, attitudes, and any behaviours of interest they may have witnessed. Next, of those not randomly assigned to the direct survey condition, participants were either in the control condition, or the UCT condition. Here, participants were presented with a series sets of lists of items. For each list, subjects were asked to select the number of statements that were true for them. Options ranged from numbers 0 to 5 in the control condition, and 0 to 6 in the UCT condition. Hence it was not possible for participants to signal, or researchers to know, which statements were true for respondents. As participants were assigned to each condition randomly, there should be no significant group differences. This was the case here, as can be seen in Table 4.1.

Therefore, any difference in the mean number of statements endorsed between the control and the treatment condition can be attributed to endorsement of the sensitive item in the treatment condition. For example, if the mean number of responses for set 1 in the control condition was 2, and the mean number of responses for set 1 in the UCT condition was 2.7, the mean difference, 0.7, would be interpreted as the proportion of subjects endorsing the additional item in the UCT condition. In this example, the base rate of the item of interest would be 0.70, or 70%. Hence, the base rate for the item of interest is calculated as:

$$p = M_{\text{UCT}} - M_{\text{Control}}$$

where p is the proportion of subjects endorsing the item of interest. Random assignment and large sample sizes can reduce the likelihood of intergroup differences accounting for the mean difference. Wimbush and Dalton (1997) suggest that the minimum group size for UCT should be 40 – 50 subjects. The present study utilised samples of approximately 700 (control condition = 703, UCT treatment condition = 699).

A non-sensitive control item is often included to act as a measure of UCT's effectiveness. For instance, in the present study one set in the UCT treatment condition included the item, 'I have read (online or offline) material from any political group.' This item was also included in the direct survey. Previous research suggests that there should be no significant differences between the reported base rates of the control item in the direct survey condition and the UCT condition. This is because the item is not sensitive, and therefore subjects' willingness to endorse the statement should not be affected by their perception of their anonymity (LaBrie & Earleywine, 2000).

Both groups received the same on-screen instructions, as below:

"This section of the questionnaire is designed to encourage honest reporting. You will be presented with a set of statements. You will not be asked to indicate which of the statements are true for you. You will only be asked to indicate how many of the statements are true for you. For example, in the following set:

I like the beach.

I have watched a play this month.

I have art on my wall.

I have a guitar.

I have a cactus.

If you 'like the beach' and 'watched a play this month' but the rest of the statements were not true for you, you would select '2' as your answer. Only the number you choose as your answer will be visible to researchers. You are not endorsing which statements are true, simply how many are true for you. Therefore, there is no way to identify which statements are true for you."

The control group were presented with sets of non-sensitive items (such as the above example), only. These items were drawn from existing studies that have previously utilised UCT designs (see Dalton et al., 1994; LaBrie & Earleywine, 2000; Rayburn et al., 2003). Where additional control items were required, novel items were generated in the style and matching the general content of previously published items. Consideration was given to the likely base rates of the control items in order to design against ceiling effects (Glynn, 2013). There were 25 sets of five non-sensitive items. Given random assignment, matched demographics, and large enough sample sizes, the base rates of control items are assumed to occur equally across the conditions (Wimbush & Dalton, 1997). Hence, the difference between the mean number of statements endorsed by the control condition and the UCT condition is the proportion of participants in the UCT condition who endorse the additional 6th item, the item of interest.

The UCT condition duplicated the control condition exactly, with the addition of one sensitive item per set. Items were deemed sensitive if they asked the respondent to self-report past or present illegal, undesirable, or risky behaviour, such as previous criminal convictions, being violent as a child, or engaging with extremist propaganda. Items relating to family or close associates engaging in these sorts of behaviours were also deemed sensitive. However, items related to witnessing others, beyond family members and close associates, engaging in such behaviours, were not deemed sensitive. For example, consider the above control set, with the addition of a sensitive item below:

I like the beach.

I have watched a play this month.

I was violent as a child/adolescent.

I have art on my wall.

I have a guitar.

I have a cactus.

Hence participants are able to endorse the sensitive item without signalling so to researchers.

4.3.5 Procedure

Prolific allows researchers to constrain the potential subject pool by a number of pre-screening questions. These are items which Prolific users self-report upon registration to the service. Of the approximately 70,000 potential subjects, we limited the sample to those aged 18 – 50 years old, who currently resided in the UK, US, or Western Europe. This identified a potential pool of approximately 27,000 participants from which we recruited.

The survey was administered online, hosted by Qualtrics, and delivered exclusively via Prolific. We collected the pre-screening data for a number of demographic items. These were current place of residence, sex, highest education level, marital status, socioeconomic status, and employment status (see Table 4.1). Therefore, subjects were not asked to report these items during the survey. Subjects were paid at a rate of approximately £5.00/hour for participating in the survey, estimated to take 15-20 minutes after piloting. There were no missing values.

4.4 Results

A criterion for measuring the effectiveness of UCT is whether the protocol elicited higher base rate estimates of sensitive items than the direct survey (Dalton et al., 1994; Wimbush & Dalton, 1997). In the present study, this was largely not the case. In fact, the direct survey protocol was found to elicit higher base rate estimates of most of the sensitive

items. This section presents a comparison of the base rates obtained from the different survey methods. A full table of the general population base rate estimates is published on the OSF, here.

Given that the UCT condition received sets consisting of six items, it follows that the mean number of statements endorsed should be higher than the control condition (who received sets of five items). This was not the case for 17 of the 25 items. Examining the differences between the means, these appeared to be small to almost negligible. If none (or very few) of the UCT condition endorsed the sensitive item, the mean number of statements endorsed in both conditions would be roughly the same. UCT is known to be less effective when measuring low base rate items; this may be the case here. With little established prior knowledge or estimates of the base rates of the present items, there was no evidence beyond conjecture to suggest that these items may be low prevalence in the general population, and so it was necessary to test this empirically.

To investigate further, I conducted a multivariate ANOVA. Box's Test was significant and four DV's violated assumptions of equality of variance. MANOVA is fairly robust against violations of these assumptions, given large and relatively equal sample sizes, as I have here, hence I proceeded. The MANOVA was significant for condition, (F (25, 1376) = 7.17, p < .000; Wilk's Λ = .115, partial $\eta2$ = .12). Table 4.2 summarises the results.

Table 4.2. Multivariate analysis of variance of the 25 sensitive items obtained via indirect questioning for the control and UCT conditions

Item	df	df error	F statistic	partial η^2	Condition	Mean	Mean Diff	Std. Error	Estimated Base Rate
Engaged with the materials of any political group (control)	1	1400	26.24	.020	Control	1.81	0.274	.052	27.4%***
					UCT	2.09			
Required support as a child	1	1400	10.90	.006	Control	3.18	-0.176	.061	17.6%**
					UCT	3.00			
Expressed a desire to hurt others	1	1400	7.89	.004	Control	2.47	0.150	.052	15.0%**
					UCT	2.62			
Engaged with materials about lone-actor terrorists	1	1400	3.80	.004	Control	1.20	0.104	.045	10.4%*
					UCT	1.31			
Virtual interactions with extremists online	1	1400	56.80	.046	Control	1.15	-0.403	.049	-40.3%***
					UCT	0.75			
Joined a wider extremist group	1	1400	9.30	.006	Control	2.39	-0.220	.069	-22.0%**
					UCT	2.17			
Rejected from a political group	1	1400	9.30	.006	Control	2.28	-0.163	.058	-16.3%**
					UCT	2.12			
Item					Condition	Mean	Mean Diff	Std. Error	Estimated Base Rate
History of substance abuse					Control	1.62	0.102	.056	10.2%
					UCT	1.72			
Perpetrated domestic abuse					Control	2.68	0.068	.062	6.8%
					UCT	2.75			
Family members made verbal statements in support of violence					Control	1.52	0.060	.054	6.0%
					UCT	1.58			
Close associates involved in criminality or extremism					Control	1.57	0.033	.054	3.3%
					UCT	1.61			
Participated in high-risk activism					Control	1.82	0.006	.054	0.6%
					UCT	1.83			
Previous criminal convictions					Control	2.59	-0.067	.052	-6.7%
					UCT	2.53			

Violent as a child	Control	2.14	-0.032	.061	-3.2%
	UCT	2.11			
Extreme views	Control	1,96	-0.022	.059	-2.2%
	UCT	1.94			
Previously imprisoned	Control	2.43	-0.055	.053	-5.5%
	UCT	2.38			
Searched online for extremist materials	Control	1.90	-0.033	.062	-3.3%
	UCT	1.86			
Committed an act of violence as an adult	Control	1.26	-0.044	.050	-4.4%
	UCT	1.23			
Spouse involved in extreme political movement	Control	1.58	-0.070	.056	-7.0%
	UCT	1.51			
Face-to-face interactions with members of an extremist group	Control	2.17	-0.003	.048	-0.3%
	UCT	2.17			
Access to a stockpile of weapons	Control	2.41	-0.095	.064	-9.5%
	UCT	2.31			
Tried to recruit others to form an extremist group	Control	1.61	-0.021	.060	-2.1%
	UCT	1.59			
Engaged with the propaganda of an extremist group	Control	1.49	-0.046	.052	-4.6%
	UCT	1.45			
Engaged with propaganda of lone-actor terrorists	Control	2.04	-0.061	.055	-6.1%
	UCT	1.98			
Arrested as a juvenile	Control	2.14	-0.028	.052	-2.8%
	UCT	2.11			

*** p <.000, ** p <.01, *p <.05

First, the item *required support as a child* was endorsed by 17.60% of the UCT group. Second, the item *expressed a desire to hurt others* was endorsed by 15.00% of the UCT group. Third, the control item, *engaged with materials from any political group* was endorsed by 27.4% of the UCT group. Lastly, the item *engaged with materials about lone-actor terrorists* was endorsed by 10.40% of the UCT group. In the remaining four instances, I found a negative estimate of the base rate of the sensitive items, i.e. a deflation effect. The item *engaged in virtual interactions with extremists online* was endorsed by -40.30% of the UCT group. The item *joined a wider extremist group* was endorsed by -22.00% of the UCT group. Lastly, the item *rejected from a political group* was endorsed by -16.30% of the UCT group.

To investigate further, I compared the results of the UCT protocol with the direct questioning protocol (see Table 4.3). Z-tests were used to compare the two proportions. Only positive proportions were compared, as a negative proportion here is illogical. The results suggest that the UCT protocol did not elicit higher base rates than the direct survey protocol. Therefore, the base rate estimates obtained from the direct survey appear to be the most suitable under the present study conditions.

Table 4.3. Estimates of the base rates of sensitive items from the UCT and direct survey protocol.

Items	UCT condition (n = 699)	Direct survey (n = 706)	Std error	Lower bound 95% CI	Upper bound 95% CI
Engaged with the materials of any political group (control)	27.4%	56.1%***	0.338	0.235	0.338
Engaged with propaganda about other lone-actor terrorists	10.4%	18.7%***	0.009	0.162	0.198
Perpetrated domestic abuse	6.8%	10.1%*	0.015	0.004	0.062
Family made verbal statements in support of political violence	6.0%	4.4%			
History of substance abuse	10.2%	9.5%			
Expressed a desire to hurt others	15.0%	12.8%			
Participated in high-risk activism on behalf of a group	0.6%	0.1%			
Close associates involved in criminality or extremism	3.3%	1.7%			
Previous criminal convictions	-6.7%	2.6%			
Violent as a child/adolescent	-3.2%	5.1%			
Extremist views	-2.2%	4.3%			
Previously imprisoned	-5.5%	1.3%			
Required additional support as a child	-17.6%	8.1%			
Searched online for extremist materials	-3.3%	7.1%			
Committed an act of violence as an adult	-4.4%	6.8%			
Spouse involved in extreme political movement	-7.0%	0.9%			
Face-to-face interactions with members of an extremist group	-0.3%	7.2%			
Access to a stockpile of weapons	-9.5%	3.3%			
Virtual interactions with extremists online	-40.3%	10.9%			
Joined a wider extremist group	-22.0%	0.1%			
Rejected from a political group	-16.3%	0.6%			
Attempted to recruit others to form an extremist group	-2.1%	0.1%			
Engaged with the propaganda of an extremist group	-4.6%	19.6%			
Engaged with propaganda by lone actor terrorists	-6.1%	11.9%			

Arrested as a juvenile	-2.8%	5.0%	

*** p <.000, ** p <.001, * p <.05

4.5 Discussion

This study is best considered as a *first step* towards establishing general population base rate estimates of risk factors and indicators associated with engagement in violent extremism. Comparing two survey questioning designs suggests that direct questioning may be the most appropriate under the present study conditions (although this is not without limitations). This section discusses why this might be, and the implications of developing general population base rate estimates for risk and threat assessment.

4.5.1 Survey methods in terrorism research

It was necessary to undertake a test of survey methods for a number of reasons. First, there was a lack of previous research to draw upon. To the best of my knowledge, no previous studies have attempted to explicitly measure general population base rates of terrorism risk indicators in a general population. Therefore, there was little to draw from to evaluate the validity of any estimates obtained. That being said, base rates of more general indicators such as mental disorder, are available and generally well-established. For example, the life-time prevalence of any mental disorder in a general population is reported as 25.0% (CI 95 24.2–25.8), which is concordant with what was established here (26.2%) (Corner et al., 2016; Investigators et al., 2004). However, estimates of how often the general population engage with extremist propaganda or interact face-to-face with extremists for example, are not readily available.

Second, establishing the base rates of sensitive items is challenging. As previously described, direct surveys may be subject to a number of biases, however indirect surveys may similarly be subject to sampling variance, ceiling effects, and deflation (as observed here). Gomes et al. (2019) recently conducted a systematic review of experiments on measurement biases in self-reports of offending behaviour and demonstrated the range of potential biases

that may occur under varying conditions. Their review identified 21 studies which considered the effect of manipulations on self-reported offending behaviour, such as mode of administration, questionnaire design, anonymity, and the supervision of data collection.

In terms of mode of administration, Gomes et al. (2019) found no difference between personal interviews, paper-and-pencil, or computer-administered questionnaires. However, they suggest caution as this is not in-line with the sensitive questioning literature, reviewed above. One reason for their findings may be the limited number of experiments, in some cases carried out decades ago. They summarise that generally, personal interviews are seen as a weaker measurement mode, given the need for participants to report sensitive information face-to-face.

In terms of data collection, Gomes et al. (2019) found no effect of supervision, i.e. teachers supervising pupils did not increase youth's self-reports of offending behaviours. They did however report one study which presented evidence for self-reporting offending behaviour in anonymous (versus confidential only) conditions (van de Looij-Jansen, Goldschmeding, & de Wilde, 2006). This is consistent with the present results.

Furthermore, the systematic review identified marginally significant ORs indicating that 1) some evidence suggests studies which do not disclose information to third parties elicit better response rates, and 2) interviewer characteristics (such as formal dress versus casual dress) have a marginal effect on self-reporting offending behaviour. Of relevance here, participants were explicitly informed that their anonymised data would be shared with third parties. This was deemed necessary and so a possible limitation that must be accepted.

In terms of questionnaire design, Gomes et al. (2019) identified 2 out of 4 studies where a 7-point response format (such as a Likert scale) elicited significantly higher self-reports of offending. Additionally, one study found significantly higher self-reports of offending behaviour for shorter items, suggesting long questions may increase participant

fatigue; consistent with the self-report literature. The present study was reasonably long overall, some items could be considered lengthy, and the items required predominantly yes/no responses. The effect of these design choices should be considered, however as Gomes et al. (2019) conclude, no design will be absent of bias. Yet, there may be scenarios where certain designs are more suitable than others.

Third, given the relative recency of crowdsourcing samples, particularly in terrorism research, it is necessary to test the functionality of different survey methods in potentially novel populations. Indirect questioning emerged predominantly in response to reporting biases observed in traditional research settings. Conducting research with online access panels may have important differences, as the present results suggest. Hence this was a necessary first step, and further research to test (by replication) these findings is necessary. Next I offer possible reasons why the UCT protocol was not successful.

Contrary to much previous research, the results suggest that the UCT protocol did not elicit higher base rates than the direct survey protocol. This has been reported previously (Ahart & Sackett, 2004; Biemer & Brown, 2005; Starosta & Earleywine, 2014). Sometimes this is presented as evidence that subjects may overreport items perceived to be socially desirable, despite being sensitive (Starosta & Earleywine, 2014). This could account somewhat for the present findings. For instance, considering the control item, engaging with mainstream politics may be deemed socially desirable by some, and hence, subjects may overreport whether they have engaged with the materials of any political group in a direct survey. This may explain why 56.1% of respondents endorsed this statement in the conventional survey and just 27.4% did so in the UCT protocol. However, Starosta and Earleywine (2014) report lower base rate estimates for socially undesirable items, too. This is sometimes interpreted as evidence that participants may also overreport socially undesirable items. However, this may in fact be a deflation effect.

In a number of instances, participants endorsed significantly fewer statements overall (resulting in negative estimates of the overall base rates) in the UCT condition. This may be a deflation effect given the nature of the items (relating to terrorism and extremism), the nature of the sample, and the delivery mode of the survey. Prolific's subject pool are experienced survey respondents whose perceptions of their own anonymity may be different to the more traditional, offline subject, i.e. an undergraduate student participating in a pencil-and-paper survey with an interviewer present in a lab setting. First, Prolific users are operating online, which negates the need for face-to-face contact. This may increase a user's perception of their own anonymity in itself, as previously discussed. Second, users are assured of their anonymity by Prolific, as well as by researchers utilising the platform. More importantly, the majority of these users regularly use Prolific and so may have greater trust, through lived experience, in assurances of their anonymity. Hence, the UCT manipulation, under the present study conditions, may not be necessary. In fact, it may have had a countereffect, resulting in deflation effects.

One explanation would be that users may have been suspicious of the UCT protocol and the relevance of the seemingly innocuous list items to the risk assessment of terrorists (anecdotally, I did receive some communications expressing such concerns). Moreover, many of these users often participate in a wide range of research and are exposed to a plethora of questions and content, including those sensitive in nature. Upon registering for the service, Prolific asks users pre-screening questions about their criminal history and mental health, for example. If users are deterred by the level of disclosure required, perhaps they may not complete registration. Hence the nature of the Prolific sample may in fact facilitate the use of direct questioning methods.

The conditions under which some indirect questioning protocols result in more truthful answers have been explored empirically (John, Loewenstein, Acquisti, & Vosgerau,

2018). Moreover, previous studies utilising UCT have reported deflation effects. Zigerell (2011) state misreporting is more common when 1) the items are very socially undesirable, 2) more respondents desire being associated or disassociated with the item, 3) respondents associate with many, or few, of the control items. In the present study, care was taken to design against very high, or very low variance, in an attempt to control for ceiling or near-ceiling effects. However, the other points may be valid, given the nature of the sensitive items investigated here. Direct questioning has a number of advantages over indirect questioning, particularly considering the advantages of obtaining participant-level estimates over aggregated group-level base rates, and so these findings may be useful for future research in terrorism studies, and for sensitive research more generally.

4.5.2 Base rates and risk assessment

The development of base rates of risk and protective factors will impact upon different forms of risk and threat assessment differently. For example, actuarial methods focused upon risk prediction fundamentally depend upon the development of empirically established risk factors. Developing base rates, and predictors of various risk specifications are important steps, alongside many others, to such an establishment. For the assessment and management of violent extremism, actuarial methods may have the greatest utility for triage and case prioritisation processes when volume is high, but resources are finite. However, actuarial approaches are not suitable for all stages of the risk assessment and management process (Douglas, Cox & Webster, 1999; Dvoskin et al., 2001; Hart, 1998; Litwack, 2001).

The limitations of actuarial approaches include generalisability beyond the samples used in development of a tool, the challenge of applying statistical knowledge to a clinical setting, the propensity of actuarial methods to exclude potentially important risk factors, rigidity of actuarial models and their lack of space for change, and failure to address violence

prevention and risk management. In addition, the actuarial method has the potential to disregard the different dynamics of risk, including the nature, severity, imminence, duration and frequency of future violence (Hart, 2003). Further, Hart, Michie & Cooke (2007) argued that although actuarial methods are reasonably reliable for group estimations of risk, they are not reliable for estimations of an individual's risk of future violence.

The utility of base rates is different for those risk assessment processes more reliant on human judgement and where the goal is risk prevention. General population base rates can assist clinical unstructured approaches which likely underestimate the frequency of exposure-related behaviours or overestimate the frequency of other suggested causes based on the practitioner's memory of previous empirical findings, and perhaps intuition (Grove, Zald, Lebow, Snitz & Nelson, 2000).

SPJ approaches encourage practitioners to review all available clinical data to identify any potential risk factors, which are found in a structured manual based on empirical evidence (Douglas et al., 2003). Based on these factors, a final structured risk judgement is made, which indicates the risk of violence (Douglas et., 2003). Unlike actuarial methods, the SPJ does not include fixed guidelines on how to calculate level of risk, instead SPJ tools are structured to guide the decision-making process of practitioners. Tools in this category include a list of risk factors, all of which have been empirically supported, with guidelines on how these risk factors are scored and on how to reach a final judgement of different gradations of risk (Douglas et al., 2003). SPJs therefore require the inclusion of the right factors and indicators in any tool to guide the professional's judgment. The development of base rates is one of many important steps toward this goal.

One step in the SPJ process is the generation of a statement of understanding about the case (e.g. the formulation). Evaluations of formulations are beginning to grow "based on the premise that the quality of case formulations may impact on outcomes" (McMurran &

Bruford, 2016; 32). Bucci et al.'s (2016) systematic review found eight separate quality assessment measures of case formulations. One consistent feature of these assessment measures concerns external coherence (e.g. the degree to which it is consistent with empirically supported theory). The development of base rates is key to this particularly when we consider issues concerned with equifinality and multifinality (Gill, Farnham & Clemmow, in press).

4.5.2 Limitations and future research

The present study is not without limitations and it is important to consider these and their implications when interpreting the results. First, the sample was not representative. At the time of conducting this research, Prolific began testing a beta version of a functionality that would allow researchers to generate a representative sample. This may be a promising development for future research, particularly in any attempt to replicate the present findings. Second, whilst the results suggest that in the present case, direct questioning elicited the most suitable estimates, I do not suggest that these are not also subject to self-reporting biases (see Gomes et al., 2019, as discussed above, for a more detailed explanation of these).

Third, Prolific users, whilst more naïve than MTurk users, are not a naïve population. It is important to consider the implications this may have for any applications of our findings. However, traditional survey samples such as student populations, are equally, perhaps more so, experienced research participants, and so Prolific may in fact provide researchers with access to a relatively novel population. Equally, the present UCT design was drawn from previous studies that successfully elicited higher base rate estimates of sensitive items. However, some have suggested strategies for designing UCT protocols against potential negative effects, some of which I may have succumbed to here. For instance, Glynn (2013)

recommend using negative within-list correlations to reduce variance and bias due to ceiling effects. This too may be a promising avenue for future research to consider.

4.6 Conclusion

This chapter presents the first study to generate base rate estimates of risk factors and indicators associated with engagement in violent extremism in a general population. These are available freely on the OSF as a resource for future research and for the information of risk assessment (and other) practitioners. Generating general population base rate estimates addresses a gap in the terrorism literature, but also has relevance to research on violence in general, where general population base rates have equally been somewhat neglected. Terrorism is a low-base incident, hence collecting large amounts of data poses significant challenges. Many studies rely on in-depth interviews with current or former radicals and retrospective case-studies (for example see Sageman, 2014). A core challenge of conducting systematic, evidenced-based approaches within terrorism studies is the low number of empirical studies (LaFree et al., 2018). Hence, collecting data via surveys may be a promising way to attenuate these issues. The findings of the present study may be evidence for how best to collect information for research deemed sensitive, particularly when dealing with subjects who participate online.

Having established preliminary base rates estimates for correlates of extremism, the next step is now to consider how the general population sample differs from an offending sample. To do so, in the next chapter the base rate estimates are employed in a direct comparison with the lone-actor terrorist sample described in chapter 3.

Chapter 5: The Base Rate Study: Comparing lone-actor terrorists and the general population.

Whilst the evidence base for risk factors and indicators for violent extremism has grown exponentially, the *relevance* of risk factors found to be prevalent in offending samples is not yet well-established. This has important implications not only for the social and scientific study of the terrorist, but practically, in terms of threat and risk assessment. Prevalence rates from descriptive studies of terrorists are difficult to apply to triaging a single case, particularly without an understanding of how these risk factors occur among the general population. Practitioners need more than an understanding of 'presence', they need an understanding of 'relevance' (Gill, Marchment & Clemmow, under review).

The PEP typology in chapter 3 articulates how different co-occurrences of risk factors may signal the emergence of motivation towards terrorist violence; this is one way to begin to establish relevance. Another way to do so is to undertake research that employs a control group in order to understand how those vulnerable to terrorism may differ from a 'normal' population. However, as previously described, research on terrorism rarely employs a control group (Desmarais et al. 2017). Doing so is necessary to generate a robust evidence base to inform counterterrorism practice and policy. Hence, the following chapter explores risk factors that may differentiate between a sample of lone-actor terrorists and the general population.

5.1 Introduction

Beyond establishing relevance, relying exclusively on research that selects on the dependent variable may be problematic. Selecting on the dependent variable restricts a set of observations to cases in which a phenomenon of interest has been observed. In doing so, you exclude cases where the phenomenon was not observed. This is often the case in terrorism

research where we predominantly employ samples of terrorists, only. For instance, Pape (2005) undertook an analysis of a universe of suicide terrorist attacks and was subsequently critiqued for sampling on the dependent variable (Ashworth, Clinton, Meirowitz & Ramsay, 2008). Ashworth et al. (2008; 4) claim that "because Pape collects only instances of suicide terrorism, his data do not even let him calculate the needed associations." Research employing offending samples is useful and the source of important findings. However, in order to establish a reliable and robust evidence base from which to draw, control groups studies are needed.

Excluding cases where the phenomenon did not manifest risks overpredicting the likelihood of violence. Moreover, many cases may exist where the theorised putative cause was present but did not generate the phenomenon of interest. The effect is essentially hypotheses which cannot be falsified. Hence this chapter aims to begin to establish relevance whilst addressing concerns about sampling on the dependent variable. In the next section I review research on terrorism that compares violent extremists with a general population control group.

5.1.1 Comparing violent extremists and control groups

Some studies compare different types of terrorists (Corner et al., 2015), others compare terrorists with analogous offenders like mass murderers (Clemmow et al., 2020; Silver et al., 2016), some compare violent and non-violent terrorists (LaFree et al., 2018), and others compare those with and without violent extremist attitudes (Bhui, Everitt & Jones, 2014). For the purpose of the present study, I outline the results of studies that compared those who engaged in terrorism or held attitudinal affinity with a violent extremist cause, with members of the general population.

First, some studies focus on socio-demographic characteristics. The results are mixed. Altunbas & Thornton (2011) found UK based jihadist terrorists ($n = 54$) to be younger and more educated than the general population. Costello et al. (2016) surveyed 1, 034 youth and young adults in the US regarding exposure to online extremism. Less education was associated with exposure to online extremism. On the other hand, Bartlett and Miller (2012) compared terrorists to those who held extreme yet non-violent beliefs. Terrorists were less likely to be employed and generally less educated.

Other studies focus on more sociological aspects. For example, Bartlett and Miller (2012) found no difference in terms of alienation, experiences of discrimination, and levels of religiosity between terrorists and radicals. De Waele and Pauwels (2014) examined self-reported right-wing political violence amongst a sample of 2, 879 Flemish adolescents. Those who self-reported conducting political violence were found to be less socially integrated.

Some studies look specifically at risk factors for terrorism. Dhumad et al. (2020) compared 160 terrorists to 65 murderers and 88 controls across a number of prevalent risk factors for terrorism. They found that, compared to controls, terrorists had significantly lower rates of harsh treatment as a child, but significantly higher rates of disobedience as a child, conduct disorder, and endorsement for terrorism. Challacombe and Lucas (2019) employed the TRAP-18 amongst 30 violent sovereign citizens and 28 non-violent sovereign citizens. They found that the TRAP-18 significantly differentiated between violent and non-violent actors on all but 5 of the tool's indicators (directly communicated threat, failure to affiliate, failure of sexual-intimate pair bonding, mental disorder, and greater creativity).

More complex research designs look at a range of influences. For example, Bhui, Silva, Topciu & Jones (2016) found that those who scored higher on sympathies for violent extremism were older, suffered depressive symptoms, more educated, had problems with the police, and reported having something valuable stolen. Those who scored lower were less

likely to have recently suffered the death of a close friend, relative, partner, spouse, child, or parent. They were also less likely to report interpersonal problems, a serious injury or illness, a major life stressor, and engaged in less non-violent political activity.

Other studies have found higher rates of particular mental health disorders within terrorist samples compared to the societal base rate. These studies include schizophrenia and psychosis in Dutch foreign fighters (Weenink, 2015), schizophrenia, autism, and delusional disorder in lone-actor terrorists (Corner et al., 2016), and subscale measures of psychopathic deviate, paranoid, depressive, schizophrenic, and hypomanic tendencies in Palestinian and Israeli terrorists (Gottschalk & Gottschalk, 2004). Other studies find lower rates of personality disorders, and psychiatric illness compared to non-ideologically inspired murderers (Lyons & Harbinson, 1986).

Hence, there is some evidence to suggest that violent extremists differ in measurable ways from the general population. Control group studies are key to developing understanding of a range of grievance-fuelled violence offenders. However, in terms of developing base rates, control group studies only measure and report on the independent variables they employ; as developing general population base rates is largely not the purpose of this type of research, it would not be expected otherwise. Hence the present study makes an important contribution to this literature as the first study to explicitly measure differences between general population base rate estimates, and an extremist offending sample.

As in previous chapters, indicators were conceptualised as relating to propensity, situation, and exposure, based on analytical guidance from the RAF. A series of chi-square or Fisher exact (where appropriate) tests were conducted to discern statistical differences between the general population and the lone-actor terrorist sample. A number of significant differences are observed: 1) lone-actor terrorists demonstrated propensity indicators related to a cognitive susceptibility, and a crime- and/or violent propensity more often; the general

sample demonstrated protective factors more often, 2) lone-actor terrorists demonstrated situational indicators related to a crime- and/or violent propensity more often, whereas the general population sample experienced situational stressors more often, 3) lone-actor terrorists demonstrated indicators related to exposure to extremism more often. However, no single factor 'predicts' violent extremism. This bears implications for our understanding of the interrelation of risk and protective factors, and for the risk assessment of violent extremism

5.2 Method

Indicators were conceptualised as relating to propensity, situation, and exposure, as in previous chapters.

5.2.1 Data

In terms of the offending sample, the lone-actor terrorist dataset, described in detail in chapter 3, was employed here. To briefly reiterate, the defining criterion for a lone-actor terrorist was whether subjects carried out or planned to carry out, alone, an attack in service of some form of ideology, for which they were convicted or died in the attempt. All individuals (n = 125) planned their attack in the UK, US, Europe or Australia, between 1990 and the end of 2015.

The data were open source and collated predominantly from LexisNexis searches. Three coders independently coded the presence or absence of an indicator. Where differences were apparent and unable to be reconciled, a senior researcher reviewed the original source documentation, consulting the previously described continuum of reliability to inform judgements.

In terms of the general population sample, the base rate estimates developed in chapter 4 were employed here. A full description of the data collection and sampling methodology is presented in the previous chapter. However, briefly, the data were collected via Prolific, an online access panel designed for academic research. Subjects were recruited from a pool of participants from the UK, US, and Western Europe. Participants were paid a small wage of approximately £5/hour upon completion. The survey took approximately 20 minutes to complete. See Table 4.1 for a summary of all descriptive statistics.

Given the results of comparing the direct and indirect questioning designs, estimates of the base rates of items deemed sensitive are reported from the results of the direct survey condition, only (n = 706). All items deemed non-sensitive were asked of the full sample (n = 2,108).

5.3 Results

The following section compares the prevalence of propensity, situation, and exposure indicators between lone-actor terrorists and the general population sample. Chi-square and Fisher's exact tests were used, where appropriate.

5.3.1 Propensity

A number of significant differences were observed, as can be seen in Table 5.1. Lone-actor terrorists were significantly more likely to have previous criminal convictions, have previously been in prison, a history of substance abuse, previous military experience, or be in the military (at the time of their terrorist event), demonstrate evidence of thrill-seeking, impulsivity, diagnosed mental disorder, and be unemployed. The general population sample were more likely to have children, university experience, exceptional educational

achievements, experienced bullying as a child/adolescent, chronic stress, or experienced

violence other than bullying or domestic violence.

Table 5.1. A comparison of lone-actor terrorists with a sample from the general population across propensity indicators.

Propensity indicators (non-sensitive)	General population (n = 2,108)	Lone-actor terrorists (n = 125)	Chi-square statistic	Std. Err	Lower bound 95% CI	Upper bound 95% CI
Unemployed	14.0%	38.4%***	54.06	0.033	-0.3091	-0.1790
Previous military experience	2.8%	22.4%***	119.18[a]	0.018	-0.2306	-0.1604
Currently in the military	0.3%	4.0%***	33.23[a]	0.006	-0.0498	-0.0245
Evidence of thrill-seeking behaviours	14.0%	29.6%***	22.51	0.033	-0.2199	-0.0913
Low self-control	10.1%	36.0%***	77.98	0.029	-0.3170	-0.2018
Diagnosed mental disorder	26.2%	40.8%**	12.69	0.041	-0.2258	-0.0655
University experience	52.8%***	35.2%	14.56	0.046	0.0854	0.2657
Exceptional educational achievements	36.9%***	16.8%	20.68	0.044	0.1141	0.2871
Grew up in an abusive home	15.0%***	4.0%	11.58	0.032	0.0466	0.1732
Victim of bullying as a child/adolescent	50.9%***	12.0%	71.65	0.046	0.2993	0.4797
Chronic stress	52.0%***	31.2%	20.51	0.046	0.1182	0.2986
Children	30.5%*	20.8%	5.25	0.042	0.0139	0.1792
Victim of violence other than bullying/DV	11.8%*	4.8%	5.68	0.029	0.0124	0.1269

Expelled from any educational institution	5.9%	4.0%				
Obsessed with an event or phenomenon	37.3%	28.8%				
Rejected from the military	1.8%	3.2%				
Single	34.7%	42.4%				
Grew up in a religious household	43.9%	36.0%				
Underwent a religious conversion	13.5%	18.4%				
Overconfidence/self-aggrandisement	20.3%	16.8%				
Anger management problems	31.5%	37.6%				
Evidence of psychological distress	53.8%	47.2%				
History of self-isolation	42.4%	49.6%				

Propensity indicators (sensitive)	Direct sample (n = 706)	Lone-actor terrorists (n = 125)	Chi-square statistic	Std. Err	Lower bound 95% CI	Upper bound 95% CI
Previous criminal convictions	2.5%	48.8%***	264.06	0.028	0.4085	0.5194
History of substance abuse	9.5%	26.4%***	28.69	0.024	0.1848	0.2797
Previously imprisoned	0.4%	26.4%***	139.70	0.021	0.2096	0.2929
Required support as a child	8.1%	6.4%				

Violent as a child/adolescent	5.1%	8.8%
Arrested as a child/adolescent	5.0%	8.0%
Perpetrator of domestic abuse in adulthood	10.1%	10.4%

5.3.2 Situation

Table 5.2 summarises comparisons between the lone-actor terrorist and the general population sample across situational indicators. Lone-actor terrorists were significantly more likely to have recently been made unemployed, experienced proximal crisis, prejudice or injustice, escalating anger, and to have dropped out of school/university. The general population sample were more likely to have experienced a death in the family, been interrupted in pursuit of a proximate goal, had a promise broken, been disrespected, ignored by someone important to them, felt like a helpless victim, problematic personal relationships, financial problems, harm due to the negligence of someone else, and been the victim of physical or verbal assault.

Table 5.2. A comparison of lone-actor terrorists with a sample from the general population across situation indicators.

Situation indicators (non-sensitive)	General population (n = 2,108)	Lone-actor terrorists (n = 125)	Chi square statistic	Std Error	Lower bound 95% CI	Upper bound 95% CI
Proximal crisis	33.6%	53.6%***	20.86	0.021	-0.5010	-0.4200
Dropped out of school/university	2.8%	12.8%***	37.19	0.028	-0.3156	-0.2043
Escalating anger	9.20%	35.3%***	83.75	0.034	-0.1389	-0.0053
Experienced prejudice/injustice	16.0%	23.2%*	4.48	0.040	0.1198	0.2780
Family death	27.1%***	7.2%	24.27	0.043	0.1221	0.2908
Interrupted in pursuit of a proximate goal	33.4%***	12.8%	23.00	0.046	0.4355	0.6159
Lied to/had a promise broken	53.4%***	0.8%	130.45	0.046	0.2804	0.4593
Experienced being disrespected	58.6%***	21.6%	65.69	0.046	0.3351	0.5156
Ignored by someone important to them	52.1%***	9.6%	85.40	0.044	0.1738	0.3459

Situation indicators (sensitive)	Direct sample (*n* = 706) Life-time prevalence	In the last year	Lone-actor terrorists (*n* = 125)	Chi square statistic	Std Error	Lower bound 95% CI	Upper bound 95% CI
Not cared for by someone important	36.4%***		10.4%	35.06	0.042	0.0980	0.2617
Felt like a helpless victim	30.0%***		12.0%	18.54	0.046	0.1307	0.3110
Problematic personal relationships	49.3%***		27.2%	23.06	0.046	0.1392	0.3195
Financial problems	49.3%***		26.4%	24.87	0.027	0.0374	0.1421
Harmed by the negligence of someone else	9.8%**		0.8%	11.29	0.037	0.0103	0.1539
Victim of physical/verbal assault	20.2%*		12.0%	5.02	0.021	-0.5010	-0.4200
Recently became unemployed	7.6%		29.6%				
Experienced being degraded	22.8%		16.8%				
Proximate life change	18.3%		11.3%				
Expressed a desire to hurt others	12.7%	7.4%	64.0%***	171.43	0.039	0.4358	0.5892

Committed an act of violence	6.5%	0.8%	41.6%***	125.67	0.031	0.2895	0.4122
Access to a stockpile of weapons	3.3%	1.7%	54.8%***	287.47	0.030	0.4521	0.5709

*** p <.000, ** p <.00, *p <.05

5.3.3 Exposure

Table 5.3 displays the results of a series of exposure-related items that asked the general population sample to what extent they had witnessed certain behaviours. These items were transformed from items originally indicative of leakage in the lone-actor terrorist codebook. The purpose of doing so was to act as a crude proxy measure for extremism in the general population.

Table 5.3. The prevalence of witnessed or observed behaviours in a general population sample.

Exposure indicators (non-sensitive)		General population ($n = 2,108$)
Aware of someone else's grievances		23.3%
Aware of someone else's extremist ideology		22.6%
If yes, did they commit an act of extremist violence?		3.7%
Witnessed someone produce letters or public statements		13.4%
Witnessed someone make verbal statements to a wider audience		33.9%
Witnessed a direct threat of extremist violence		7.8%
Exposure indicators (sensitive)	Direct sample ($n = 706$)	Direct sample ($n = 706$)
	Life-time prevalence	In the last year
Have you interacted online with extremists?	2.3%	1.2%
Have you ever held extremist beliefs	1.4%	0.8%

Table 5.4 details the results of comparing the lone-actor terrorists to the general population sample across exposure indicators. Lone-actor terrorists were significantly more likely to demonstrate evidence of all but two exposure indicators; engaged with propaganda by lone-actor terrorists (i.e. manifestos), and engaged with materials about lone-actor terrorists (i.e. news stories and propaganda). The former was found to be significant ($p < .05$) however the CI included 0 and so was deemed non-significant.

Table 5.4. A comparison of lone-actor terrorists with a sample from the general population across exposure indicators.

Exposure indicators	Direct sample (*n* = 706)	Lone-actor terrorists (*n* = 125)	Chi square statistic	Std error	Lower bound 95% CI	Upper bound 95% CI
Joined a wider group	0.1%	31.2%***	223.58	0.021	0.2699	0.3513
Close associates involved in violent/ extremist action	1.7%	25.6%***	120.98	0.022	0.1964	0.2816
Face-to-face interactions with extremists	7.2%	39.2%***	102.58	0.032	0.2579	0.3816
Virtual interactions with extremists	10.9%	31.2%***	36.41	0.033	0.0672	0.1946
Attempted to recruit others to join/form a wider group	0.1%	19.2%***	132.19[a]	0.016	-0.0645	-0.0006
Rejected from a political group	0.6%	8.8%***	40.62[a]	0.013	0.0570	0.1077
Engaged with propaganda of wider group	19.5%	62.4%***	101.38[a]	0.043	0.3451	0.5120
Spouse involved in wider movement	0.8%	5.6%**	15.56[a]	0.012	0.0239	0.0711
Engaged with propaganda by lone-actor terrorists	18.7%	26.4%*	3.96	0.032	-0.0142	0.1122
Engaged with materials about other lone-actor terrorists	11.9%	16.8%				

*** $p < .000$, ** $p < .01$, *$p < .05$, [a]Fisher's exact

Lastly, I present a comparison of the mean number of propensity, situational, and exposure indicators between the two samples. Whilst MANOVA is fairly robust to violations of its assumptions, this is largely only the case when considering large and equal sample sizes. This was not the case here, and so a series of independent sample t-tests were conducted (alpha adjusted for multiple comparisons). Table 5.5 displays a comparison of the mean number of sensitive and non-sensitive propensity, situational, and exposure indicators between the two groups. In terms of the indicators deemed non-sensitive, there was no significant difference between the mean number of non-sensitive propensity indicators experienced by the two groups. The general population sample experienced significantly more non-sensitive situational indicators (t(155.03) = 8.245, $p < 0.000$, d = 0.76), than lone-actor terrorists. In terms of the indicators deemed sensitive, lone-actor terrorists experienced more propensity (t(143.86) = -7.908, $p < 0.000$, d = -0.77), situation (t(129.37) = -18.290, $p < 0.000$, d = -1.78), and exposure (t(138.75) = -9.591, $p < 0.000$, d = -0.93) indicators than the general population.

Table 5.5. A comparison of the mean number of propensity, situation, and exposure indicators (sensitive and non-sensitive) in lone-actor terrorists and a general population sample.

	General population (n = 2108)	SD	Lone actor (n = 125)	SD	Mean difference	Std Error Difference	Lower bound 95% CI	Upper bound 95% CI
Propensity (non-sensitive)	5.63	2.64	5.66	2.89	0.12			
Situational (non-sensitive)	5.30	3.75	3.23	2.65	2.07***	.2506	1.571	2.561

	General population (n = 706)	SD	Lone actor (n = 125)	SD	Mean difference	Std Error Difference	Lower bound 95% CI	Upper bound 95% CI
Propensity (sensitive)	0.41	0.85	1.35	1.28	0.94***	.119	-1.173	-.704
Situational (sensitive)	0.10	0.31	1.60	0.91	1.5***	.082	-1.662	-1.337
Exposure (sensitive)	0.72	1.27	2.66	2.21	1.95***	.203	-2.347	-1.544

*** p <.000, ** p <.01, *p <.05

5.4 Discussion

The present study aimed to measure differences between general population base rate estimates of correlates of violent extremism and a population of lone-actor terrorists. A number of significant differences were observed. In this section, I discuss the results of the series of direct comparisons relating to propensity, situation, and exposure.

5.4.1. Propensity

Lone-actor terrorists were significantly more likely to display indicators previously theorised to relate to a terrorist propensity. That is, indicators inferred to be proxy measures for a cognitive susceptibility and a crime and/or violent propensity (Bouhana, 2019; Corner et al., 2019). In chapter 3, the susceptible PEP highlighted a pattern of indicators including mental disorder, thrill-seeking, and impulsivity (among others). This configuration was discussed with reference to previous research that highlights the role of impaired higher order functioning in crime and violence research in general. The present results suggest that these indicators are in fact more prevalent among lone-actor terrorists when compared to the general population, and so provide further evidence for considering these as putative risk factors.

Lone-actor terrorists were significantly more likely to have a diagnosed mental disorder than the general population sample, thus replicating Corner et al. (2015). Previous research on terrorism has examined the role of mental disorder in engagement in violent extremism. Studies have measured the prevalence rate of reported clinical diagnosed mental health disorders at 4.54% in a sample of European jihadists (n = 242); 7.6% US far-right inspired group members who had committed at least one murder (n = 92), 11.9% in a diverse ideological sample of terrorist group members (n = 97), 12.9% of Palestinian lone-actor terrorists (n = 62), 25.6% of US ideological active shooters (n = 40,), 31.9% of lone-actor

terrorists (n = 119), 32.7% of lone-actor terrorists (n = 49), 40.4% of far-right inspired lone-actors who had committed at least one murder (n = 47), 43.7% of US extremists (n = 284), and 57% of white supremacists (n = 44) (Bakker, 2006; Bubolz & Simi, 2019; Capellan, 2015; Corner & Gill, 2019; Gill, Corner, McKee, Hitchen, & Betley, 2019; Gill, et al., 2014; Gruenewald et al., 2013a; LaFree et al., 2018; Perry et al., 2018).

The present results reiterate the relevance of mental disorder in understanding vulnerability to violent extremism. Based on the RAF, mental disorder may be associated with an increased susceptibility to moral change, leading to radicalisation. Hence it follows that known terrorists would demonstrate these indicators more often than the general population. However, whilst the present findings restate the importance of considering mental disorder as a risk factor, previous research also demonstrates the multifinality of violent radicalisation and mental health problems (Gill et al., in press). Here, I only considered the *presence* of a diagnosed mental disorder as a risk factor. Future research should consider how different disorders, or even different active symptoms may map onto terrorist propensity. This will allow us to better specify *when and for whom* mental disorder drives vulnerability.

Lone-actor terrorists were also significantly more likely to display indicators related to low self-control. Self-control was disaggregated into two facets, impulsivity and thrill-seeking. Previous research demonstrates that the two can have independent effects on behaviour (Lynam & Miller, 2004). Hence, I consider these independently throughout this thesis. Both thrill-seeking and impulsivity were found to be significantly more prevalent among lone-actor terrorists than the general population.

The role of self-control in crime and violence in general is well-established, perhaps most notably in criminological theory as Gottfredson & Hirschi's (1990) general theory of crime. In fact, a systematic review finds impulsivity to be a consistent predictor of violence (Jolliffe et al., 2009). Thrill-seeking too, is often associated with aggression (Wilson &

Scarpa, 2011) and crime/delinquency in general (Burt & Simons, 2013; Eysenck & Eysenck, 1978; Hansen & Breivik, 2001; Horvath & Zuckerman, 1993; Pfefferbaum & Wood, 1994).

Research on extremism too widely acknowledges the role of low self-control in pathways to violent extremism. Some theorise the role of stable personality factors in engagement in violent extremism (Horgan, 2003; Kruglanski, Jasko, Chernikova, Dugas, & Webber, 2018; Victoroff, 2005). For instance, Borum (2003) summarises a number of attitudinal predispositions which may impact upon the development of a terrorist propensity. For instance, thrill-seeking may be a significant 'pull' factor, via perceived excitement, that attracts some to violent extremism.

Others demonstrate empirical evidence for low self-control as a risk factor for violent extremism. Schumpe, Bélanger, Moyano and Nisa (2018) conducted a series of studies to empirically test the role thrill-seeking in political violence, in the context of Significance Quest Theory (SQT). Over seven studies, the authors found a positive effect of thrill-seeking on support for political violence. Furthermore, Nussio (2020) compared voluntary and nonvoluntary joiners of Colombian insurgent and paramilitary groups, arguing that the nonvoluntary joiners would have similar characteristics to non-joiners. Despite similarities in demographic characteristics, the nonvoluntary joiners scored higher on three measures of sensation seeking (boredom susceptibility, disinhibition, and thrill and adventure-seeking). The present findings situate among this existing research by providing evidence that low self-control appears to be more prevalent among those who go on to commit solo (and perhaps other types of) terrorist violence.

Lone-actor terrorists also demonstrated higher frequencies of proxy indicators of a crime and/or violent propensity, including a greater likelihood of having a history of substance abuse, having a criminal conviction, previous military experience, and/or experiencing imprisonment.

Previous criminality and violence are often found to be correlates of violent extremism. However as discussed in chapter 2, a review of research found the evidence to be mixed (Desmarais et al., 2017). However, the present findings suggest that a crime and/or violent propensity may in fact differentiate those vulnerable to engaging in terrorism from the general population. Basra and Neumann (2016) describe the interplay of criminality and terrorism as the 'new crime-terror nexus.' They suggest a number of ways in which previous criminal and/or violent behaviour may incline a person towards engaging in terrorism. These include 'the redemption narrative' (i.e. criminals who turn to terrorism over more mainstream religious narratives to atone for their past behaviours), terrorism as legitimisation for crime, extremists deliberately targeting criminals, prisons as radicalisation and recruitment hotspots, an individual-level susceptibility for crime, violence, and therefore terrorism, and transferrable skills including weapons knowledge, operational security tactics, and financing.

A review of previous research also found that lone-actor terrorists were more likely to have military experience than the general population (Pantucci, Ellis & Chaplin, 2016), concordant with the present findings. Ellis et al. (2016) suggest that military experience and combat training may relate to a person's ability to carry out a successful attack, and perhaps a more lethal attack. Furthermore, the RAF suggests that an offender's perception of their own capability may sustain their motivation to act. Hence military experience may be an important proxy for capability when considering the risk assessment of potential offenders. Capability can be an important factor in identifying those likely to commit actual violence from a pool of potential subjects of interests. For instance, the Vulnerability Assessment Framework (VAF) implemented by Channel in the UK considers capability as a risk factor which may signal motivation and/or intent (Home Office, 2012).

However, to some extent the present findings may be unexpected. The general population were significantly more likely to experience a range of distal stressors such as

growing up in an abusive home, being a victim of bullying and other types of violence, and experiencing chronic stress. Despite the greater levels of distal stressors within the general population sample, they were also more likely to display factors often considered to be protective against criminal engagement, such as university experience, being employed, and having children.

The effect of risk factors may be moderated and/or mediated by the presence of protective factors (Rutter, 1987; Sameroff & Fiese, 2000). Ttofi et al. (2016) defines these as 'interactive protective factors' whilst Hall et al. (2012) refer to them as 'buffering protective factors.' Rutter (1987) elaborates further by emphasising that it is the interactional nature of risk and protective factors that matters. It is in such adverse circumstances (e.g. the experience of risk factors) where the true value of protective factors becomes apparent.

Protective factors have also been categorised as factors that directly reduce dysfunction and thus negate risk. Such protective factors predict a low probability of offending in the general population and simply halt the onset of risk factors (Dickens & O'Shea, 2018). This impact is not contingent upon the level of risk faced. Hall et al. (2012) labels these as 'direct protective' factors. These can span a range of individual, attitudinal, family, educational, peer, and community factors (Lösel et al., 2018). This may be particularly relevant here when considering potential protective factors which relate to increasing informal social control, such as having children (Haggård, Gumpert, & Grann 2001; Lodewijks, de Ruiter, & Doreleijers, 2010; Ulmer and Steffensmeier, 2014). For instance, in a qualitative study of 401 high-risk violent offenders, Haggård et al. (2001) found that stable relationships and children were associated with successful desistance.

Hence in the present study, among the general population, the effect of seemingly high prevalence rates of risk factors often correlated with engagement in terrorism may be 'buffered' by the presence of protective factors. In general, findings such as these continue to

highlight the need to conduct control group studies. More specifically, further research is necessary in order to determine the potential mediating effect of supposed protective factors among the general population. As previously described, many risk assessment tools currently do not consider the role of protective factors in formulating judgements of risk. The present findings again suggest that this may be an oversight which risks overpredicting violence.

5.4.2 Situation

Lone-actor terrorists were more also likely than the general population to demonstrate situational indicators indicative of a pre-existing crime and/or violent propensity, including expressing a desire to hurt others, committing proximal violence, and having access to a stockpile of weaponry. This is perhaps unsurprising given that these are proximal indicators related to attack planning and preparation, and all of these offenders at least planned to commit a solo terrorist offence. Behavioural threat assessment in particular focusses on such warning behaviours. The present findings provide further evidence that practitioners should attend to occurrences of these indicators, given the relatively low prevalence of these among the general population.

However, the general population sample was significantly more likely to experience a range of, and in fact more of, a number of situational stressors. This is not to say that acute strain is unimportant in understanding trajectories to lone-actor violence. In fact, a number of studies have demonstrated the role of acute and general strain in targeted violence (Silver et al., 2019; Vossekuil et al., 2015). Instead, these findings highlight the problem of specificity.

A significant proportion of the general population experience a number of strains and stressors (in the present instance, more so than among the lone-actor terrorist sample), however do not go on to commit extremist violence. However, acute strain may act as a catalyst, or tipping point, alongside the co-occurrence of individual-level susceptibilities,

situational factors, and varying degrees of exposure. Hence it is important to understand the interactions *among* risk factors; an approach I expand upon in the next chapter.

Equally, it is important to consider the different data collection methodologies when considering these findings. The lone-actor terrorist data was collated by researchers following a rigorous and robust open-source data collection methodology. The general population self-reported these experiences. That is, I compare information drawn from secondary sources to that of self-evaluation. The fact that the latter demonstrated significantly more situational stressors may be due in part to those experiences being more accessible when self-reporting this information, and less accessible, because less reported on, when relying on third-party sources of data. This is akin to the availability bias elaborated upon in chapter 3, and is important to bear in mind here. I expand upon this in more detail in terms of the limitations of the present study.

5.4.3 Exposure

Lone-actor terrorists were significantly more likely to demonstrate a range of indicators of exposure to violent extremism. This is again perhaps not surprising given that exposure to terrorism-supportive people, places, and settings is a key developmental element in violent extremism (Taylor & Horgan, 2006; Wiktorowicz, 2004). The fact that the general population sample report far fewer indicators related to exposure, in the presence of higher rates of some propensity and situational risk factors in some cases, suggests that exposure may mediate the risk of engaging in violent extremism. This has particular relevance for preventative approaches which focus on policing extremist content, online and offline, as well as counter-messaging, to some extent (Braddock & Horgan, 2016).

Exposure likely impacts upon trajectories to violent extremism at multiple points. For instance, in a qualitative analysis of 14 adolescents and young adults (16 to 25 years old),

extremists of different ideologies described how exposure occurred during belief formation, engagement, and on towards violent action (Pauwels, Brion, & De Ruyver, 2014). Hence, exposure is likely to impact upon the development of radical beliefs and beyond, towards the devlopment of the motivation to act.

Empirical research demonstrates a tentative causal relationship between exposure and extremist views. A systematic review of research on the links between exposure to online radical content and violent radicalisation identified 10 empirical studies supportive of this position (see Hassan et al., 2018). Results suggest that exposure to radical content may be associated with *extremist attitudes*.

Considering *motivation and/or action*, previous research similarly suggests that exposure may be related to violent political action. For instance, Gill et al. (2015) found exposure indicators such as offline network connections and online exposure behaviours, to be highly prevalent in a sample of lone-actor terrorists. In a general population sample, Pauwels and Schils (2016) found that those who self-initiated exposure to radical material online were more at risk of engaging in self-reported political violence. This was also true compared to those who were inadvertently exposed to extremist content online.

Much of the existing research focusses predominantly on online exposure. However, research also points toward the joint influence of online and offline dynamics (Gill et al., 2015). Of note, Pauwels et al. (2014) found that associating with both delinquent peers and peers with racist attitudes, were also strongly related to engaging in political violence. Similarly, Drevon (2016) and Von Behr, Reding, Edwards and Gribbon (2013), considered the interaction of online and offline exposure in pathways to violent extremism. As such, Hassan et al. (2018; 84) note that "the intricacies of online and offline networks in the trajectory to violent radicalisation are relevant and merit further attention."

Some studies examine the role of offline exposure in violent extremism. Perry, Wikström and Roman (2018) considered the effect of law-related moral beliefs, self-regulation (self-control), and criminogenic exposure on extremism. They utilised data from the Peterborough Adolescent and Young Adult Development Study; a longitudinal study, ongoing at the time (684 young adults, mean age = 19 years old, 50.1% female). To note, the study examined exposure to *criminogenic* settings, and not specifically to extremism-promoting settings. They found that criminogenic exposure was significantly correlated with the potential to engage in violent extremism. More specifically, criminogenic exposure differentiated between the potential for extremist beliefs and extremist action. Morality and self-control predicted the potential for both, however criminogenic exposure only had an effect on the potential for moving beyond beliefs and onwards to violent action.

Perry et al. (2018) discuss this finding in relation to the widely acknowledged 'gap', particularly in psychology, between beliefs, or attitudes, and behaviour. Sawyer and Heinz (2016) also note that social psychology has repeatedly demonstrated weak relationships between extreme beliefs and extreme behaviour. The fact that exposure may differentiate between beliefs and violent action is therefore of particular interest. Perry et al. (2018) propose that moving from belief to action requires desensitising, or 'training' and that criminogenic exposure may be a mechanism by which this is achieved.

However, many do not experience negative consequences from viewing extremist materials (Gerstenfeld, Grant, & Chiang, 2003; Keipi, Oksanen, Hawdon, Näsi, & Räsänen, 2017). This is likely due in part to differences in propensity (e.g. individual-level susceptibilities) and situational influences (Bouhana, 2019). Therefore, establishing how risk factors interact dynamically to drive violent extremism, is key.

Equally of interest here is in demonstrating the prevalence of exposure within the general population. A seemingly large minority of the general population sample were aware

of someone in their network's adoption of an extremist ideology (22.6%) and had engaged with extremist propaganda (19.5%). Smaller numbers witnessed direct threats of extremist violence (7.8%), or directly interacted with extremists both offline (7.3%) and online (10.9%), or associated with individuals involved in violent extremist actions (1.7%). Some of these results may be larger than one might expect.

As previous research demonstrates, there is rarely a single factor driving engagement in violent extremism. It is usually a crystallisation of multiple push and pull factors. Whilst many indicators were more likely or just as likely to be experienced in the general population, on average, lone-actor terrorists were more likely to experience a greater number of indicators inferred to relate to a cognitive vulnerability (propensity), a crime- and/or violent propensity (situation), and exposure. No single factor can easily discriminate between the samples. The process of committing terrorist violence is more likely to be a dynamic interaction among individual-level vulnerabilities (i.e. cognitive and/or moral susceptibilities), varying degrees of situational strain, and differential exposures to terrorism-supportive settings (Bouhana et al., 2016; Bouhana & Wikström, 2010, 2011; Corner et al., 2019; Wikström & Bouhana, 2017).

5.5.4 Limitations and future research

The present study is not without limitations. First, in terms of the data, it is important to bear in mind the limitations of both the lone-actor terrorist data (discussed at length in chapter 3) and the general population base rates data (discussed at length in chapter 4). These limitations have relevance here, too. Second, as described above, comparing two different data collection methodologies (researcher observations from secondary data, to self-reports) may be problematic. Ideally, future research should consider comparing base rates identified through direct questioning within a general population and a terrorist sample. Having said

this, given the difficulties engaging a sufficiently high number of terrorists in a single research design, I believe the present approach still provides valuable information, given that its limitations are acknowledged.

Second, the sample sizes are unequal. Chi-square tests are largely robust against inequalities of variances (as opposed to test such as ANOVAs), however the effect of comparing such a large dataset to a seemingly small offender sample is important to consider. Despite the fact that the lone-actor terrorist dataset is essentially a population (within the stated data collection parameters), the sample remains small. This is a common limitation of research on terrorism, given its rarity. This is one reason why replication in terrorism studies is particularly important, as the evidence base is often based on sample sizes which in parallel fields may be considered insufficient.

Lastly, the present findings relate to the presence of single factors, which may help in the development of triage processes when volume is high, but resources are finite. However, it is important to note that for more in-depth, structured professional judgements of potential violent extremist risk, it is insufficient to only examine the *presence* of indicators. For example, just because a factor such as problematic personal relationships is more likely in the general population, does not mean it should not be considered when judging extremist risk. It might be highly relevant to understanding particular cases. This is why future research should consider the dynamic interactions *among* these risk factors.

5.5 Conclusion

The Base Rate Study presented in chapter 4 and 5, is the first step toward establishing general population estimates of risk factors and indicators associated with violent extremism. It is necessary to seek to replicate these findings in order to provide robust estimates for use in implementing, evaluating, and designing risk assessment tools. It is hoped that by making

the base rate study materials freely available on the OSF, researchers may be encouraged to undertake replication studies. Whilst the results of the Base Rate Study are descriptively useful, they are largely concerned with single factors. Whilst an important research endeavour with particular implications for threat and risk assessment, as alluded to, more may be gleaned from considering how these risk factors *interact* to drive violent extremism. This is the focus of the final empirical chapter.

Chapter 6: Risk factors and indicators for engagement in violent extremism: A network approach

Chapter 2 reviewed correlates of extremism across different terrorist types (Bouhana & Wikström, 2011; Desmarais et al., 2017; Gill et al., 2014; Lösel et al., 2018; McGilloway et al; Monahan, 2012; 2016). Moving towards a process approach, it then discussed conceptual models of radicalisation that articulate causal mechanisms theorised to underpin the phenomenon (Borum, 2003; Bouhana, 2019; McCauley & Moskalenko, 2008; Moghaddam, 2005; Neo, 2019; Precht, 2007; Sageman, 2008; Silber, Bhatt, 2007; Taylor & Horgan, 2006; Veldhuis & Staun, 2009; Wiktorowicz, 2004). Chapter 3 drew from Corner et al. (2019) who advocate 'bridging the gap' between qualitative and quantitative approaches in terrorism research, to tie the correlates specified by behavioural profiles to the underlying processes delineated by such models. The RAF has been employed suchlike as analytical guidance throughout this body of work. The RAF articulates the emergence of risk as the outcome of a complex, dynamic system. Whilst chapter 4 and 5 undertook important work towards establishing general population base rate estimates, more may be understood from considering how risk factors *interact* to drive extremism. In the final empirical chapter, I introduce terrorism studies to psychometric network modelling; a relatively novel methodology from psychology. I aim to model the interactions among risk factors and visualise the complex, dynamic system theorised to underpin terrorist risk.

6.1 Introduction

Numerous correlates have emerged as potential risk factors for engagement in violent extremism. However, we understand little of how interactions *between* these factors drive terrorism. In terms of research, traditional analytical strategies predominantly identify prevalent risk factors in offending samples, such as age or gender. However, in practice,

preventative approaches continue to evolve towards a 'whole systems' public health approach, for instance the PREVENT program in the UK (Home Office, 2018). Prevalence rates of static risk factors may therefore lack the practical utility necessary to formulate successful interventions, given the multifinality of these, and the equifinality of pathways to engagement in violent extremism.

The RAF articulates the emergence of risk as the outcome of dynamic, mutually reinforcing interactions converging in time and space (Bouhana, 2019). To reiterate briefly, at the individual level, extremist violence risk can be thought of as the outcome of interactions between differing individual-level susceptibilities (propensity), situational factors, and exposure, via mechanisms of self- and social-selection. However, modelling this complexity whilst preserving the benefits of operationalising observable behavioural indicators (such as those afforded to practitioners) can be challenging.

Psychometric network modelling from the field of psychology is capable of modelling such complexity. Insights from network graph theory (such as those implemented in social network analysis) can provide further insights into the network structure of a phenomenon. Hence I employ network modelling to visualise the interactions among risk factors theorised as relating to propensity, situation, and exposure, with three main aims: 1) to introduce psychometric network modelling to terrorism studies as a promising new analytical strategy to model complexity, 2) to provide data-driven, empirical evidence for the risk analysis framework hypothesised by the RAF, 3) to utilise insights from network graph theory to detect pathways to exposure to violent extremism, which may be directly relevant to preventing engagement in terrorism.

6.2 Background

This section first describes how quantitative research on terrorism predominantly analyses potential risk factors. Next I present psychometric network modelling as an alternative analytical strategy. I argue that as the field continues to progress beyond the pursuit of static 'profiles' of terrorists that network modelling could provide novel insights into a complex phenomenon. Lastly, I detail the rationale for utilising insights from network graph theory to highlight pathways to exposure.

The effect of risk factors on specified outcomes of interest, for instance radicalisation, has been examined extensively. Most often an effect is considered upon a dependent variable, as in traditional inferential analysis such as regression modelling. For instance, Pauwels and Schils (2016) used binary logistic regression models to examine the effect of active exposure to violent extremism via new social media on self-reported political violence. Similarly, Bhui et al. (2014) examined the effect of depression, psychosocial adversity, and limited social assets on the process of radicalisation, measured via sympathies for violent protest and terrorism.

Other studies have examined the effect of risk factors such as mental illness in group- versus lone-actor terrorism (Corner & Gill, 2015), loss of significance and radical social network on radicalisation (Jasko, LaFree, & Kruglanski, 2017), economic, demographic, and political variables on incidences (and number of casualties) of terrorism (Piazza, 2006), economic and political marginalisation, religiosity, conversion, networks, negative catalyst events, problematic social relations, and violence exposure, on radicalisation in Kenya (Rink & Sharma, 2018), and more.

More complex designs employ analytical strategies such as structural equation modelling to examine the multivariate relationships among a number of factors. For instance, Canetti-Nisim, Halperin, Sharvit and Hobfoll (2009) outlined a stress-based model of political extremism. They modelled interactions among exposure, psychological distress,

perceived threat, sociodemographic variables, religiosity, political stand, and democratic views, on the outcome, exclusionist political attitudes. Macdougall, van der Veen, Fedds, Nickolson and Doosje (2018) examined the effects of emotional uncertainty, need for belonging, justice seeking, sensation seeking, need for romance, need for existential meaning, and need for status, on two outcomes, support for violent organisations, and support for non-violent organisations.

Such studies are explanatory and offer much-needed insight into causality. However, more novel approaches demonstrate the complexity of violent extremist risk. Corner et al. (2019), as previously described, utilised proximity coefficients and state-transition diagrams to articulate temporal pathways to lone-actor violence across radicalisation, attack preparation, and attack phases of the offence process. The resultant diagrams tangibly visualise the complexity of the phenomenon and suggest the need for a new approach. Similarly, multidimensional scaling techniques, such as smallest space analysis, too demonstrate the multiple interactions among risk factors (Gill, 2015a; Horgan et al., 2018). Psychometric network modelling could afford terrorism researchers, and researchers of crime in general, the analytical capabilities to model the complexity that existing research highlights. In fact, McCuish, Bouchard and Beauregard's (2020) recent work on the longitudinal association between psychopathy and offending versatility demonstrates how the network framework can be applied to criminological problems.

A network approach is increasingly popular in psychological sciences, specifically psychopathology, and emerged as an alternative to the latent variable model. Rather than conceptualising mental disorders, such as depression, as the *root cause* of passive symptoms, disorders are considered systems of mutually reinforcing interactions *among* symptoms (Borsboom, 2008). For instance, fatigue and low mood (symptoms of depression) in the latent variable model, are considered passive indicators of the underlying cause, depression.

The alternative model states that fatigue and low mood *interact with* and *cause* each other. I argue that extremist risk can be conceptualised in the same way; where there is no underlying root cause, but rather radicalisation emerges as the outcome of mutually reinforcing causal interactions among risk factors. Equally, network analysis is model free and driven by the data. As in chapter 3, an inductive approach is a useful complement to existing deductive research.

The network approach has been employed extensively to model complex, multidimensional constructs in research on psychopathology (Robinaugh, Hoekstra, Toner, & Borsboom, 2020), attitudes (Dalege, Borsboom, van Harreveld, Waldorp, & van der Maas, 2017), personality (Costantini et al., 2015), behaviour (De Beurs, 2017; Heino et al., 2019), and more. Psychometric network graphs consist of nodes and edges where nodes represent variables and the edges define the nature of the statistical relationship among these variables. These differ from social network graphs where the edges between nodes are *observed.* In social network analysis, an edge between node A and node B would indicate a real-world connection between person A and person B. In psychometric network modelling, the edges are parameters estimated from data.

Metrics from network graph such as centrality measures, provide further insight into the structure of psychometric network graphs. For instance, in the present study I estimate node centrality to identify the most influential nodes in the network. Identifying influential nodes may highlight important mediators as well as potential targets for interventions to 'dismantle the network.' It is also possible to detect sub-communities within a larger network which provide an insight into clusters of nodes and how these relate the larger structure. Another feature allows for the identifications of shortest paths, or pathways. Here, I describe pathways from communities of propensity and situation nodes, to exposure.

As discussed in chapter 5, exposure to terrorism-supportive people, places, and settings is key to the emergence of violent extremism (Taylor & Horgan, 2006; Wiktorowicz, 2004). It is difficult to conceive of someone engaging in an act of ideologically motivated violence without prior exposure to said ideology. Research on exposure suggests that its effects are likely multifinal, and that pathways to exposure are equally equifinal. In the previous chapter, I highlighted research which ties exposure to belief formation, engagement, and violent action (Pauwels, Brion, & De Ruyver, 2014). Hence, understanding the drivers of exposure may help signal those most vulnerable, at multiple points along the extremist trajectory. In the present study, I conceptualise exposure as *active* (e.g. self-initiated) or *passive* (e.g. inadvertent/accidental), which has been done previously (Pauwels, et al., 2014; Pauwels & Schils, 2016). The purpose of doing so is to allow the model to consider the interactions among active and passive exposure, separately. This is because inadvertent exposure to extremism is likely not driven by the same processes as self-motivated exposure to extremism (Pauwels et al., 2014).

In the present study, I continue to operationalise guidance from the RAF, however, a number of theoretical models consider the role of exposure in engagement in violent extremism (Borum 2003; Moghaddam 2005; Neo 2016; Precht 2007; Silber and Bhat 2007; Sageman 2008; Wiktorowicz 2004; Taylor & Horgan, 2006; Wiktorowicz, 2004). To briefly recap, the RAF articulates the emergence of terrorist risk as the outcome of interactions between individuals with a pre-existing propensity (cognitive and/or moral susceptibility) and terrorism-supportive criminogenic settings (e.g. exposure). Susceptibility is described as interactions among pre-existing morality, executive functions, and capacity for self-regulation, i.e. self-control. Individuals of differing propensities, or susceptibilities to situational influences, are exposed to terrorism-promoting settings through processes of self- and social selection. Hence, the present study aims to model the interactions between

behavioural correlates previously tied to these mechanisms in order to articulate the theoretical framework as a dynamic network.

The PEP typology in chapter 3 presented empirical evidence for the RAF, demonstrating how differing induvial-level susceptibilities interacted with situational and exposure influences along trajectories to lone-actor violence. Hence, the present study secondarily seeks to identify pathways to exposure, which may or may not provide support for the findings presented in chapter 3. As previously described, exposure may be an objectively observable proxy for belief formation, motivation, and even a precursor to committing violence.

6.3 Method

6.3.1 Sample

Chapter 4 resulted in base rates estimates for 706 members of a Western (UK, US, and Western Europe) general population. In the present study, it was necessary to collect a novel sample for two reasons; 1) 706 cases is a small sample in which to estimate the number of parameters the present analysis proposes, 2) a representative UK sample provides more generalisable results (to the UK population); this was a noted limitation of chapter 4 however since completion of that research, Prolific has implemented a method for representative sampling, which I employ here.

Thus, the survey was deployed to a nationally representative UK sample. The sample was representative in terms of age, gender, and ethnicity (simplified). Subjects were recruited via Prolific, as previously described. All participants gave informed consent. Seventy-three participants returned their submission and so their data were not collected. A further 40 participants failed to complete the study and their data were not retained.

Nine attention checks were included to control for possible inattention. As in the base rate study described in chapter 3, subjects who failed an attention check were escalated to a manual review of their data. Forty-six submissions were rejected after review. The final sample size was 1,500. Participants ranged from 18 to 87 years of age, with a mean age of 47.76 years (SD = 15.70). The sample included 773 (51.5%) females and 727 (48.5%) males. Table 6.1 details the sociodemographic descriptive statistics of the sample.

Prolific achieves a representative sample based on the most recent census information available. Invitations to participate in your study are distributed to registered users who satisfy the necessary quotas. If after 48 hours, you remain waiting for a participant to satisfy a certain quota, Prolific may relax the sampling criteria. For instance, after 48 hours, if you still require an Asian, female, aged 18 – 27 to participate in your study, Prolific will relax the constraints to invite any Asian female to complete your study. Prolific reports that the result is typically a sample that is approximately 98% representative.

Table 6.1. Sociodemographic descriptive statistics

Sociodemographic variable	Frequency	Percent
Ethnicity (Simplified)		
Asian	115	7.7
Black	55	3.7
Mixed	31	2.1
Other	24	1.6
White	1275	85
Total	1500	100
Marital status		
Divorced	129	8.6
Married	706	47.1
Never married	595	39.7
Separated	37	2.5
Widowed	33	2.2
Total	1500	100
Religion		
Agnostic	182	12.1
Atheist	505	33.7
Buddhist	14	0.9

Christian	593	39.5
Hindu	19	1.3
Jewish	9	0.6
Muslim	48	3.2
Other	127	8.5
Sikh	3	0.2
Total	1500	100
Highest level of education		
Completed college	369	24.6
Completed master's degree	207	13.8
Completed PhD	48	3.2
Completed secondary school	317	21.1
Completed undergraduate degree	533	35.5
No secondary school	2	0.1
Some secondary school	24	1.6
Total	1500	100
Current Country of Residence		
United Kingdom	1443	96.2
United States	4	0.3
Unknown	53	3.5
Total	1500	100
Employment Status		
Due to start a new job within the next month	17	1.1
Full-Time	633	42.2
Not in paid work (e.g. homemaker, retired or disabled)	325	21.7
Other	75	5
Part-Time	325	21.7
Unemployed (and job seeking)	94	6.3
Unknown	22	2.1
Total	1500	100

6.3.2 Measures

The Base Rate Survey: UK is hosted on the OSF and is available in full, here. The

risk factors and indicators reported in chapter 4 and 5, in the present study, were collected as

part of a wider survey. Hence there are some measures that appear in the full survey on the

OSF that are not utilised here. Risk factors were mapped onto *propensity, situation,* and

exposure based on analytical guidance from the RAF, as has been done throughout this thesis.

All items were reported dichotomously (i.e. 'yes' or 'no'), with the following exceptions measured as scale items. Scale items were dichotomised to model alongside binary data, as I have done previously. Thrill-seeking was measured with three items ("I sometimes find it exciting to do things that could be dangerous", "I often do things without thinking of the consequences"," Sometimes I will take a risk just for the fun of it"). Impulsivity was measured with six items ("I always say what I think, even if it is not nice or smart", "If I want something, I do it immediately", "I lose my temper easily", "When I am really angry, other people better stay away from me", "I often act on the spur of the moment without stopping to think", "I like to test myself every now and then by doing something a little risky"). Both were measured along a 7-point Likert scale (Strongly disagree to Strongly agree). To create dichotomous variables, Cronbach's alpha was calculated for each of the scales (thrill-seeking = 0.806, impulsivity = 0.726) as well as an average score for each participant. Scores of > 4 (somewhat agree, agree, strongly agree) were present and all other values were absent.

Propensity was operationalised with 23 factors: 1) victim of bullying during childhood/adolescence, 2) victim of violence other than DV or bullying in childhood/adolescence, 3) psychological distress, 4) thrill-seeking, 5) impulsivity, 6) diagnosed mental disorder, 7) difficulties coping with change, 8) history of self-isolation, 9) previous suicide attempt, 10) history of self-harm, 11) grew up in an abusive home, 12) chronic stress, 13) anger management problems, 14) obsessive thinking, 15) expelled from school, 16) problematic drug use, 17) problematic alcohol use, 18) arrested as a child/adolescent, 19) desire to hurt others, 20) violent as a child, 21) committed a violent offence, 22) committed a non-violent offence, 23) perpetrated domestic abuse.

Situation was operationalised with 19 factors. To measure *situational* indicators, rather than prevalence over a life course, respondents were asked to indicate which of these they had experienced 'within the last year': 1) recently unemployed, 2) death in the family, 3) dropped out of school/university, 4) proximate change, 5) proximal crisis, 6) worse performance at school/work, 7) work stressor, 8) goal interrupted, 9) humiliated or degraded, 10) prejudice or injustice, 11) lied to or promise broken, 12) disrespected, 13) ignored by someone important to them, 14) harmed by the negligence of someone else, 15) not cared for by someone important to them, 16) victim of physical or verbal assault, 17) felt like a helpless victim, 18) problematic personal relationships, 19) financial problems

Exposure was operationalised with 12 factors. These items differ slightly from the original Base Rate Study items. This is based upon research on exposure which considers *active* and *passive* exposure as separate, but highly related facets of exposure (Pauwels & Schils, 2016; Pauwels et al., 2014). Thus, I took the opportunity to refine measurement of exposure in the second deployment of the survey, to better reflect this body of existing work. Items were drawn from the lone-actor terrorist codebook (Gill et al., 2014), after a process of literature review, and refined during the development of a psychometric exposure scale (Clemmow, Rottweiler & Gill, under review). Active exposure and passive exposure were operationalised with 6 items each.

Active exposure: 1) interacted face-to-face with people or groups who support violent political action, i.e. white power, jihadist, radical left, 2) spent time with friends or associates who have extremist views, 3) read or distributed materials produced by people or groups who support violent political action, i.e. pamphlets, tweets, websites, letters, 4) searched online for content that supports violent political action, 5) chose to spend time in places where people or groups with extremist views spend time, 6) used the internet to have discussions with people or groups who support violent political action, i.e. white power, jihadist, radical left militant

Passive exposure: 1) known someone personally who was involved in political extremism, 2) witnessed someone threatening to commit political violence, 3) witnessed someone making statements that support violent political action, 4) been sent or recommended extremist content to watch or view online, 5) known of extremist activity going on in your community, 6) received letters, pamphlets, leaflets or other materials that promote violent political action.

6.3.3 Statistical analysis

To construct network graphs, parameters are estimated from the data and represented as a weighted network between variables. The weighted network structure is analysed using measures from network graph theory. In the present study, I compute centrality measures (strength) to estimate node importance, implement a clustering algorithm (Walktrap) to identify communities of nodes, compute a bridge centrality measure (strength) to identify important bridge nodes (bridge nodes are nodes which facilitate connections between other nodes), and compute shortest paths to identify pathways from propensity and situation nodes, to exposure.

With increasing sample size, network accuracy and centrality measures are increasingly accurate and reliable. However, sample sizes afforded to researchers, particularly in terrorism studies, are often small. Therefore, it is important to estimate the accuracy and reliability of any network. To do so, I a) estimate confidence intervals on the edge weights, b) assess the stability of centrality indices under observing subsets of cases, and c) test for significant differences between edge-weights and centrality indices. The results of these tests provide important information about the reliability and replicability of the findings.

Network estimation. I used the R package *IsingFit* (Van Borkulo et al., 2014) to estimate the network graph. The package computes a weighted, undirected network graph and applies a lasso (least absolute shrinkage and selection operator) regularisation. The lasso penalty, a regression analysis method, shrinks regression coefficients and sets very small coefficients to zero. The result is a network which is both parsimonious and optimises goodness of fit. This is one way that psychometric network modelling can handle many variables in relatively small sample sizes. In addition, the regularisation employs a tuning parameter. Values range from 0 to 1. If set to zero, the optimal tuning parameter is selected with ordinary BIC, otherwise it is selected with EBIC. In the present study the hyperparameter, gamma, was set to 0.25. Lastly, I implement the AND-rule. The AND-rule requires both regression coefficients between two nodes to be non-zero in order for a connecting edge to be present. The alternative, the OR-rule, is more lenient, where only one regression coefficient between two nodes is required to be non-zero to result in an edge connecting the two nodes.

The undirected edge weights are the mean of the logistic regression coefficients between two nodes. An edge connecting two nodes can be interpreted as a significant association, controlling for all other nodes in the network. Comprehensive tutorial papers for implementing a network approach in R are widely available (see Costantini et al., 2015; Epskamp, Borsboom, & Fried, 2018 as examples).

The Walktrap clustering algorithm (Pons & Latapy, 2005) in the *igraph* package (Csardi & Nepusz, 2006) was used to detect communities, or clusters, within the network. The algorithm is a hierarchical clustering algorithm which constructs communities based on random walks. Short distance random walks are assigned to the same community. To compute random walks, start at a node, pick a random neighbour, and move to it, then repeat.

The nodes you visit most often will be assigned to the same community. Communities were identified with *igraph* and plotted using *qgraph*.

A series of further graphs illustrating the shortest paths to exposure were created. The resultant network graphs differ from the overall graph in that they illustrate possible 'routes' to exposure, as well as potential mediating items between risk factors. Shortest paths are the minimum number of steps needed to go from one node to another.

All graphs were visualised with the *qgraph* package (Epskamp, Cramer, Waldorp, Schmittmann, & Borsboom, 2012). I implemented the Fruchterman-Reingold (Fruchterman & Reingold, 1991) algorithm which places strongly connected nodes at the centre of the graph, closer together, and less connected nodes towards the periphery of the graph.

Centrality measures. Centrality measures are one way to compute node importance in a network. Three centrality measures from network graph theory are often computed in psychometric network graphs; *strength*, *closeness*, and *betweenness*. Strength quantifies how well a node is connected to other nodes in a network. It is the sum of the standardised weights of all significant edges in the network. Closeness quantifies a node's proximity to all other nodes in the network. It is the sum of a node's shortest paths. Betweenness measures the number of times a node is on the shortest path between other nodes. The reliability, and to some extent, interpretability, of closeness and betweenness in psychometric networks is questionable (Bringmann et al., 2019; Epskamp, Borsboom, & Fried, 2018). Node strength is considered the most stable estimate of node importance. Therefore, the *bootnet* package (Epskamp et al., 2018) was used to estimate node strength, only. Centrality indices are presented as raw z-scores, where higher scores indicate greater influence over the network.

Another way to quantify node importance is *bridge centrality.* Bridges are nodes which facilitate connections between different communities of nodes. Bridge centrality is calculated as above, however considers only the number of connections between a node and

all other nodes. These are calculated as raw z-scores where higher values indicate greater importance in terms of facilitating connections between nodes. For example, in symptom networks in psychopathology, identifying bridge nodes between depression symptoms and anxiety symptoms may help identify the most appropriate target for interventions against developing comorbidity. To calculate bridge centrality, I used the *networktools* package and computed a network graph highlighting the most influential (top 80%) bridge nodes (Jones, 2017).

Network stability. It is important to calculate and report the stability of networks and all centrality indices. These metrics can inform judgements about the reliability and accuracy of network graphs. I used the R package *bootnet* to investigate the stability of the networks. I bootstrapped 95% confidence intervals around the edge weights, estimated the correlation-stability coefficient for centrality metrics (ranging from 0 - 1; values above 0.25 imply moderate stability, above 0.5 strong stability), and computed the edge-weights difference test and the centrality difference test. These methods are described in detail elsewhere (Epskamp et al., 2018). Briefly, edge weight accuracy relates to the confidence with which you can interpret the *order* of the edge weights. Low accuracy, indicated by wide confidence intervals, would mean the order of the edge weights should be interpreted cautiously. Centrality stability also relates to the degree of confidence with which you can interpret the *order* of the centrality estimates. Low centrality stability means that interpreting the order of centrality measures should proceed with caution.

6.4 Results

6.4.1 Descriptive statistics

Item descriptive statistics are presented in Table 6.2.

Table 6.2. Descriptive statistics for all items.

Propensity	%	Standard Deviation
Expelled from school	4.20%	0.20
Used drugs problematically	3.67%	0.19
Used alcohol problematically	9.07%	0.29
Arrested as a child/adolescent	6.20%	0.24
Desire to hurt others	6.60%	0.25
Violent as a child	2.47%	0.16
Violent offence	1.93%	0.14
Non-violent offence	15.87%	0.37
Perpetrator of DV	6.40%	0.24
Thrill-seeking behaviour	16.73%	0.37
Impulsivity	16.13%	0.37
Victim of bullying (as child/adolescent)	45.47%	0.50
Victim of violence (as child/adolescent)	17.33%	0.38
Psychological distress	45.47%	0.50
Diagnosed mental illness	19.80%	0.40
Difficulties coping with change	38.13%	0.49
History of self-isolation	31.00%	0.46
Obsessive thinking	33.07%	0.47
Previous suicide attempt	9.20%	0.29
Previous self-harm	17.13%	0.38
Grew up in an abusive home	15.00%	0.36
Chronic stress	43.07%	0.50
Problematic anger	23.00%	0.42

Situation	%	Standard Deviation
Dropped out of school/university	0.93%	0.10
Worse performance	7.93%	0.27
Recent unemployment	9.00%	0.29
Death in the family	22.07%	0.41
Proximate life change	14.13%	0.35
Crisis	24.20%	0.43
Work stress	18.73%	0.39
Goal interruption	28.53%	0.45
Financial problems	34.07%	0.47
Degraded	10.53%	0.31
Prejudice/Injustice	8.13%	0.27
Lied to or had a promise broken	29.27%	0.46
Disrespected	35.80%	0.48
Ignored by someone important to them	34.87%	0.48

Harmed by the negligence of another	4.93%	0.22
Not cared for by someone important to them	25.33%	0.44
Victim of physical or verbal assault	14.00%	0.35
Felt like a helpless victim	19.00%	0.39
Problematic personal relationships	29.20%	0.45

Exposure	%	Standard Deviation
Known someone who was involved in political extremism	9.07%	0.29
Witnessed threats to commit political violence	5.80%	0.23
Witnessed statements that support violent political action	14.93%	0.36
Been sent extremist content to watch or view online	6.40%	0.24
Known of extremist activity going on in your community	4.93%	0.22
Received letters, pamphlets, leaflets or other materials	4.00%	0.20
Interacted face-to-face with extremists	10.13%	0.30
Chosen to spend time with extremist friends or associates	13.93%	0.35
Read or distributed extremist materials	10.80%	0.31
Searched online for content that supports violent political action	7.53%	0.26
Chosen to spend time in places where there is extremism	5.40%	0.23
Virtual interactions with extremists	6.40%	0.24

6.4.2 Network graph

Figure 6.1 is the network graph for the full sample (n = 1, 500). Network density is a measure of connectedness. It summarises how connected the resultant graph is out of all possible connections (values range from 0 to 1). Network density was 0.13. Further details of network accuracy and stability are provided in the supplementary material. All bootstrap tests were performed with 2, 000 samples. Figure S1 displays the bootstrapped difference test between non-zero edges. Results suggest that the order of the edge weights, or the 'thicknesses' of the edges connecting two nodes, can be interpreted reasonably reliably. Figure S2 displays the bootstrapped confidence intervals of estimate edge-weights for the estimated network. Similarly, results suggest the edges are reasonably accurate. Figure 6.2 displays node strength. *Disrespected, psychological distress,* and *non-violent offending* had the highest node strength, suggesting these nodes exert greater influence over the whole network. Figure S3 in the supplementary materials displays the average correlations between

strength of networks sampled with persons dropped and the original sample. The correlation-stability coefficient was 0.439, suggesting that node strength can be interpreted with reasonable confidence.

The Walktrap clustering algorithm identified 6 communities, as can be seen in Figure 6.1. Communities were labelled based on the presenting pattern of indicators.

6.4.2.1 Community 1: Cognitive susceptibility

Nodes relating to propensity disaggregated into two communities, *cognitive susceptibility*, and *crime/violent propensity*. This is comparable to the clusters disaggregated in chapter 3 and is consistent with the RAF. *Cognitive susceptibility* includes nodes indicative of a pervasive, individual-level susceptibility including *diagnosed mental disorder, psychological distress, adverse childhood experiences, chronic stress*, and *self-isolation*. Two nodes theorised as situational factors are included; *dropped out of school/university* and *worsening performance at work or school.*

6.4.2.2 Community 2: Crime/violent propensity

Crime/violent propensity includes nodes related to criminality and/or violence. For example, *perpetrating domestic abuse, a desire to hurt others, drug and alcohol problems, exclusion from school,* and both *violent and non-violent offending*. With the exception of two situation nodes, all nodes theorised as relating to propensity were classified as such.

6.4.2.3 Community 3: Interpersonal stressors

Interpersonal stressors is a community characterised by experiences of personal (*being ignored, not cared for, problematic personal relationships*) and social (*prejudice, degraded, victimised*) stressors.

6.4.2.4 Community 4: Proximal crisis

Proximal crisis is characterised by significant, and to some extent, goal-oriented, interruptions or crises. For instance, *losing employment, significant change in life circumstances, financial problems,* and *death in the family*. This is similar to patterns of situational stressors disaggregated from a dataset of US lone-actor grievance-fuelled violence offenders (Clemmow et al., 2020).

6.4.2.5 Community 5: Self-control

Self-control includes *thrill-seeking* and *impulsivity*. As in previous chapters, I disaggregated self-control to model the facets of the construct independently, as previous research suggests that thrill-seeking and impulsivity can have independent effects on behaviour (Lynam & Miller, 2004). Figure 6.1 suggests that this may be the case here. Specifically, thrill-seeking appears associated with a crime/violent propensity, via non-violent offending, and impulsivity appears associated with situational stressors, via being disrespected. The RAF conceives of susceptibility as an interaction among pre-existing morality, executive functions, and capacity for self-control (Bouhana, 2019). This interaction can be seen in Figure 6.1 where self-control may mediate interactions among differential propensities and situational influences.

6.4.3.6 Community 6: Exposure

Active and passive exposure nodes were classified as a single community, *exposure*. Whilst the drivers of self-initiating versus inadvertent exposure to violent extremism may theoretically differ, the conceptualisation of these items as a single community illustrates the high degree of association between unintended exposure, and self-motivated exposure to terrorism (and vice versa).

Cognitive susceptibility: AbH – grew up in an abusive home, Ang – anger management problems, ChS – chronic stress, DfC – difficulties coping with change, DrO – dropped out of school/university, Isl – isolated, MnI – diagnosed mental disorder, Obs – obsessive thinking, PsD – psychological distress, Scd – suicide attempt, SlH – self-harm, VcB – victim of bullying (childhood), VcV – victim of violence (childhood), WrP – worse performance at work/school

Crime/violent propensity: AlP – problematic alcohol use, DrP – problematic drug use, Exp – expelled from school, HrO – desire to hurt others, , JvA – juvenile arrest, NVO – non-violent offence, PrA – perpetrator of domestic abuse, VlC – violent as a child, VlO – violent offence

Exposure: AwE – known someone who has extremist views, CmE – extremism in their community, DrT – witnessed direct threats of political violence, ExF – chooses to spend time with extremists friends, ExP – chooses to spend time in places where there is extremism, F2F – face-to-face interactions with extremists, OfP – received propaganda (offline), OnP – received propaganda (online), OnS – searches online for extremist content, PrE – engaged with (read or distributes) extremist propaganda, VrI – virtual interactions with extremists, VerS – witnessed verbal statements in support of violent political action

Interpersonal: Dgr – degraded or humiliated, Dsr – disrespected, Hlp – felt like a helpless victim, Hrm – harmed by someone's negligence, Ign – ignored by someone important to them, NtC – not cared for by someone important, Prj – prejudice or injustice, Prm – promise broken or lied to, PrR – problematic personal relationships, Vct – victim of verbal or physical assault

Proximal crisis: Crs – proximal crisis, FmD – death in the family, Fnn – financial problems, Int – goal interrupted, PrC – proximate life change, RcU – recently unemployed, WrS – work stressor

Self-control: Imp – impulsive, ThS – thrill-seeking

Figure 6.1. Network analysis of risk factors and indicators associated with engagement in

violent extremism. Communities identified with the Walktrap clustering algorithm.

Figure showing node strength plot titled "Strength" with nodes ordered from highest to lowest along the y-axis (Dsr, PsD, NVO, Crs, VerS, Hlp, VcV, ExP, ExF, WrP, VrI, PrE, OfP, Dgr, F2F, PrR, OnS, VlC, Ign, CmE, OnP, Ang, NtC, DrT, AwE, WrS, ChS, JvA, Exp, Prm, MnI, Isl, Vct, Scd, Int, Fnn, Prj, DfC, Imp, AbH, SlH, DrO, RcU, Obs, DrP, PrC, VcB, ThS, HrO, AlP, Hrm, VlO, FmD, PrA) and z-scores from -2 to 2 on the x-axis.

Cognitive susceptibility: AbH – grew up in an abusive home, Ang – anger management problems, ChS – chronic stress, DfC – difficulties coping with change, DrO – dropped out of school/university, Isl – isolated, MnI – diagnosed mental disorder, Obs – obsessive thinking, PsD – psychological distress, Scd – suicide attempt, SlH – self-harm, VcB – victim of bullying (childhood), VcV – victim of violence (childhood), WrP – worse performance at work/school

Crime/violent propensity: AlP – problematic alcohol use, DrP – problematic drug use, Exp – expelled from school, HrO – desire to hurt others, , JvA – juvenile arrest, NVO – non-violent offence, PrA – perpetrator of domestic abuse, VlC – violent as a child, VlO – violent offence

Exposure: AwE – known someone who has extremist views, CmE – extremism in their community, DrT – witnessed direct threats of political violence, ExF – chooses to spend time with extremists friends, ExP – chooses to spend time in places where there is extremism, F2F – face-to-face interactions with extremists, OfP – received propaganda (offline), OnP – received propaganda (online), OnS – searches online for extremist content, PrE – engaged with (read or distributes) extremist propaganda, VrI – virtual interactions with extremists, VerS – witnessed verbal statements in support of violent political action

Interpersonal: Dgr – degraded or humiliated, Dsr – disrespected, Hlp – felt like a helpless victim, Hrm – harmed by someone's negligence, Ign – ignored by someone important to them, NtC – not cared for by someone important, Prj – prejudice or injustice, Prm – promise broken or lied to, PrR – problematic personal relationships, Vct – victim of verbal or physical assault

Proximal crisis: Crs – proximal crisis, FmD – death in the family, Fnn – financial problems, Int – goal interrupted, PrC – proximate life change, RcU – recently unemployed, WrS – work stressor

Self-control: Imp – impulsive, ThS – thrill-seeking

Figure 6.2. Node strength. Values displayed as raw z-scores. Nodes ordered from highest to

lowest strength. Higher strength indicates greater overall importance to the network.
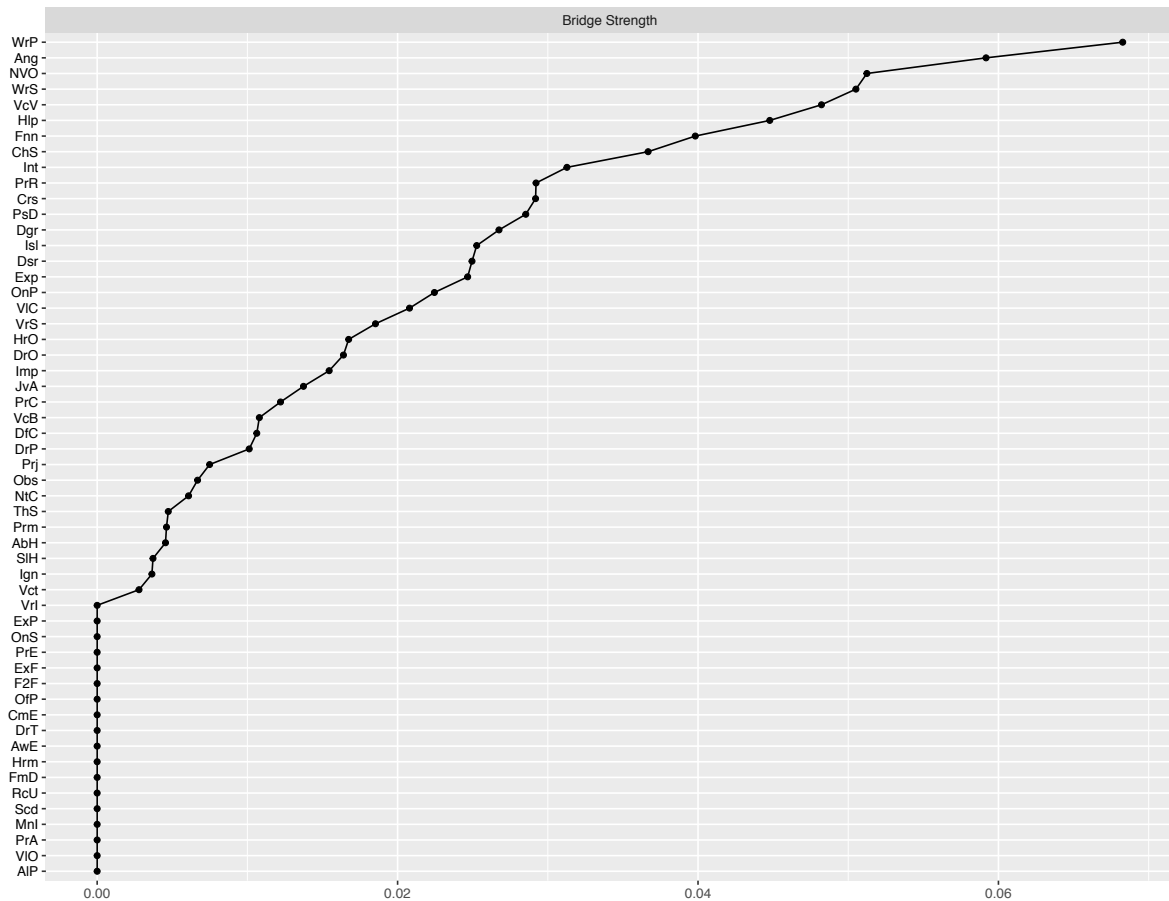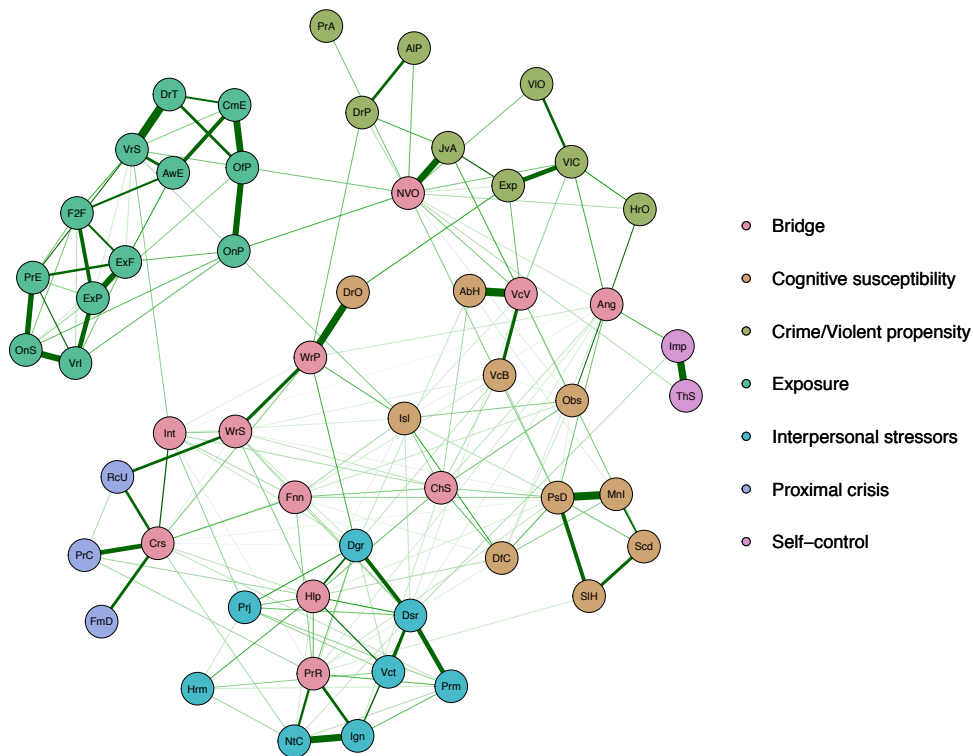
6.4.3 Bridge centrality

Bridge nodes connect other nodes or communities to the rest of the network. Prominent bridge nodes may have substantial influence over the 'flow' of interactions across a network. Suppressing a bridge node within a network, for example, may inhibit network connectivity. Previous research suggests that bridge nodes may be suitable targets for intervention in networks of comorbid mental disorders (Cramer, Waldorp, Van Der Maas & Borsboom, 2010; Fried et al., 2017). In this instance, bridge nodes may similarly be suitable targets upon which to intervene among those most at risk of engagement in extremism. Figure 6.3 displays the bridge strength centrality indices for the network. Bridge strength was normalised to account for the different sizes of the respective communities.

The correlation-stability coefficient was 0.283. Figure S3 in the supplementary materials presents the average correlations between centrality index bridge strength of networks sampled with persons dropped and the original sample. The correlation-stability coefficient is at the lower end of what is regarded as reliably interpretable (0.25 – moderately, 0.5 highly), hence the *order* of nodes should be interpreted with caution.

Worsening performance (WrP)*, anger management problems* (Ang)*, non-violent offending* (NVO), *work stress* (WrS)*,* and *victim of violence (as a child/adolescent)* (VcV) are the most important bridge nodes in the network.

Bridge Strength

Cognitive susceptibility: AbH – grew up in an abusive home, Ang – anger management problems, ChS – chronic stress, DfC – difficulties coping with change, DrO – dropped out of school/university, Isl – isolated, MnI – diagnosed mental disorder, Obs – obsessive thinking, PsD – psychological distress, Scd – suicide attempt, SlH – self-harm, VcB – victim of bullying (childhood), VcV – victim of violence (childhood), WrP – worse performance at work/school

Crime/violent propensity: AlP – problematic alcohol use, DrP – problematic drug use, Exp – expelled from school, HrO – desire to hurt others, , JvA – juvenile arrest, NVO – non-violent offence, PrA – perpetrator of domestic abuse, VlC – violent as a child, VlO – violent offence

Exposure: AwE – known someone who has extremist views, CmE – extremism in their community, DrT – witnessed direct threats of political violence, ExF – chooses to spend time with extremists friends, ExP – chooses to spend time in places where there is extremism, F2F – face-to-face interactions with extremists, OfP – received propaganda (offline), OnP – received propaganda (online), OnS – searches online for extremist content, PrE – engaged with (read or distributes) extremist propaganda, VrI – virtual interactions with extremists, VerS – witnessed verbal statements in support of violent political action

Interpersonal: Dgr – degraded or humiliated, Dsr – disrespected, Hlp – felt like a helpless victim, Hrm – harmed by someone's negligence, Ign – ignored by someone important to them, NtC – not cared for by someone important, Prj – prejudice or injustice, Prm – promise broken or lied to, PrR – problematic personal relationships, Vct – victim of verbal or physical assault

Proximal crisis: Crs – proximal crisis, FmD – death in the family, Fnn – financial problems, Int – goal interrupted, PrC – proximate life change, RcU – recently unemployed, WrS – work stressor

Self-control: Imp – impulsive, ThS – thrill-seeking

Figure 6.3. Node bridge strength. Values displayed as raw z-scores. Nodes ordered from

highest to lowest bridge strength. Higher bridge strength indicates greater overall importance

to the network.

Figure 6.4 presents the network graph with the most influential (top 80%) bridge nodes highlighted. In terms of cognitive susceptibility, *victim of violence (in childhood/adolescence)* facilitates connections between adverse childhood experiences and nodes related to a crime/violent propensity. *Chronic stress* connects nodes related to psychological distress and mental health problems, to situational stressors. *Worsening performance (at work/school)* presents similarly.

In terms of crime/violent propensity nodes, *non-violent offending* is a particularly important node. *Non-violent offending* facilitates connections between cognitive susceptibility, crime/violent propensity, and exposure communities. *Problematic personal relationships* and *feeling helpless*, both interpersonal nodes, are bridge nodes between both propensity- and situation-related nodes. Lastly, in terms of proximal crisis, *work stressor, financial problems*, and *crisis* are important bridge nodes. Interestingly, *goal interrupted* is a key bridge between propensity, situation, and exposure nodes.

Cognitive susceptibility: AbH – grew up in an abusive home, Ang – anger management problems, ChS – chronic stress, DfC – difficulties coping with change, DrO – dropped out of school/university, Isl – isolated, MnI – diagnosed mental disorder, Obs – obsessive thinking, PsD – psychological distress, Scd – suicide attempt, SlH – self-harm, VcB – victim of bullying (childhood), VcV – victim of violence (childhood), WrP – worse performance at work/school

Crime/violent propensity: AlP – problematic alcohol use, DrP – problematic drug use, Exp – expelled from school, HrO – desire to hurt others, , JvA – juvenile arrest, NVO – non-violent offence, PrA – perpetrator of domestic abuse, VlC – violent as a child, VlO – violent offence

Exposure: AwE – known someone who has extremist views, CmE – extremism in their community, DrT – witnessed direct threats of political violence, ExF – chooses to spend time with extremists friends, ExP – chooses to spend time in places where there is extremism, F2F – face-to-face interactions with extremists, OfP – received propaganda (offline), OnP – received propaganda (online), OnS – searches online for extremist content, PrE – engaged with (read or distributes) extremist propaganda, VrI – virtual interactions with extremists, VerS – witnessed verbal statements in support of violent political action

Interpersonal: Dgr – degraded or humiliated, Dsr – disrespected, Hlp – felt like a helpless victim, Hrm – harmed by someone's negligence, Ign – ignored by someone important to them, NtC – not cared for by someone important, Prj – prejudice or injustice, Prm – promise broken or lied to, PrR – problematic personal relationships, Vct – victim of verbal or physical assault

Proximal crisis: Crs – proximal crisis, FmD – death in the family, Fnn – financial problems, Int – goal interrupted, PrC – proximate life change, RcU – recently unemployed, WrS – work stressor
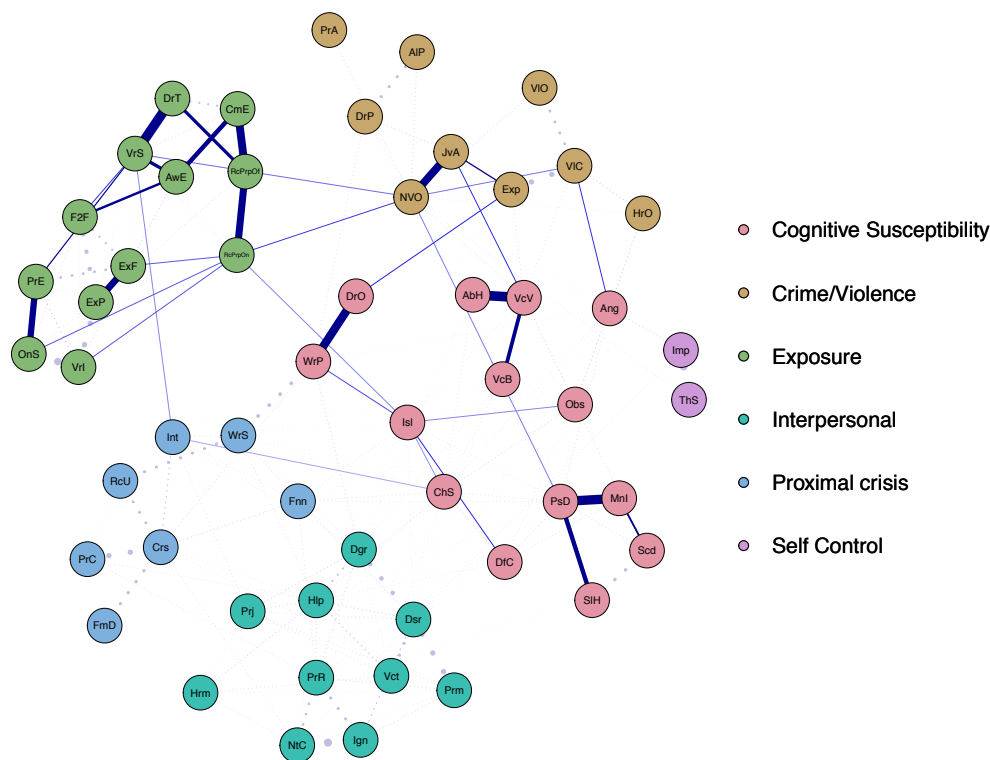
Self-control: Imp – impulsive, ThS – thrill-seeking

Figure 6.4. Network analysis of risk factors and indicators associated with engagement in

violent extremism. Most influential bridge nodes highlighted (pink).

6.4.4 Pathways to exposure

The results of chapter 3 illustrate the equifinality of pathways to extremist violence. A visual inspection of the numerous 'routes' between propensity, situation, and exposure nodes (Figure 6.1) reiterates the need to conceptualise violent extremist risk as emerging from a dynamic, interactional system. Computing shortest paths detects the 'quickest' routes to exposure and can help identify potential mediators. The resultant graphs can be seen in Figures 6.5 – 6.9.

Figure 6.5 highlights pathways from cognitive susceptibility to exposure. Activations between crime/violent and situational nodes are evident. For instance, cognitive susceptibility nodes related to poor mental health connect to exposure nodes via crime/violent propensity nodes. This is true also of nodes related to adverse childhood experiences. Interactions among nodes *obsessive thinking, chronic stress*, and *isolation* demonstrate connections with both proximal crisis nodes (*goal interrupted*) as well as a direct pathway to exposure, via *receiving propaganda online*.

Cognitive susceptibility: AbH – grew up in an abusive home, Ang – anger management problems, ChS – chronic stress, DfC – difficulties coping with change, DrO – dropped out of school/university, Isl – isolated, MnI – diagnosed mental disorder, Obs – obsessive thinking, PsD – psychological distress, Scd – suicide attempt, SlH – self-harm, VcB – victim of bullying (childhood), VcV – victim of violence (childhood), WrP – worse performance at work/school

Crime/violent propensity: AlP – problematic alcohol use, DrP – problematic drug use, Exp – expelled from school, HrO – desire to hurt others, , JvA – juvenile arrest, NVO – non-violent offence, PrA – perpetrator of domestic abuse, VlC – violent as a child, VlO – violent offence

Exposure: AwE – known someone who has extremist views, CmE – extremism in their community, DrT – witnessed direct threats of political violence, ExF – chooses to spend time with extremists friends, ExP – chooses to spend time in places where there is extremism, F2F – face-to-face interactions with extremists, OfP – received propaganda (offline), OnP – received propaganda (online), OnS – searches online for extremist content, PrE – engaged with (read or distributes) extremist propaganda, VrI – virtual interactions with extremists, VerS – witnessed verbal statements in support of violent political action

Interpersonal: Dgr – degraded or humiliated, Dsr – disrespected, Hlp – felt like a helpless victim, Hrm – harmed by someone's negligence, Ign – ignored by someone important to them, NtC – not cared for by someone important, Prj – prejudice or injustice, Prm – promise broken or lied to, PrR – problematic personal relationships, Vct – victim of verbal or physical assault

Proximal crisis: Crs – proximal crisis, FmD – death in the family, Fnn – financial problems, Int – goal interrupted, PrC – proximate life change, RcU – recently unemployed, WrS – work stressor
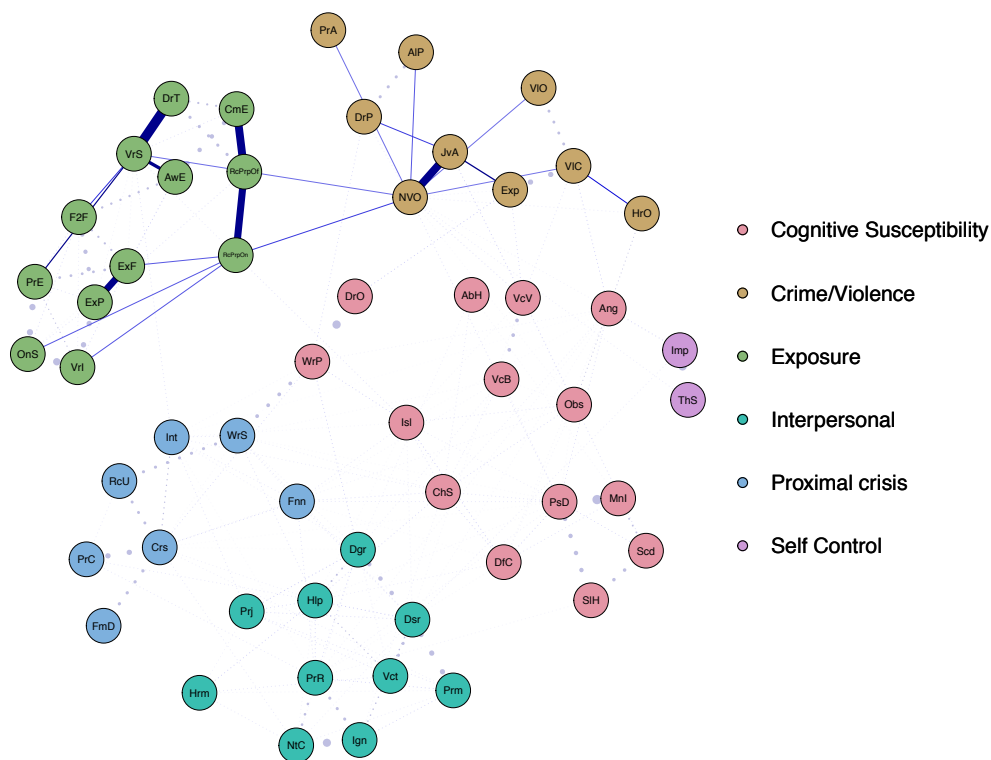
Self-control: Imp – impulsive, ThS – thrill-seeking

Figure 6.5. Network analysis of risk factors and indicators associated with engagement in

violent extremism. Shortest path from cognitive susceptibility to exposure highlighted.

Figure 6.6 highlights pathways from crime/violent propensity nodes to exposure. These shortest paths suggest that a violent propensity may be a direct driver of exposure. Interestingly, all pathways to exposure activate via passive exposure nodes. Passive exposure is highly associated with active exposure and the present findings suggest perhaps a 'gateway' to self-initiated exposure to extremist violence.

Cognitive susceptibility: AbH – grew up in an abusive home, Ang – anger management problems, ChS – chronic stress, DfC – difficulties coping with change, DrO – dropped out of school/university, Isl – isolated, MnI – diagnosed mental disorder, Obs – obsessive thinking, PsD – psychological distress, Scd – suicide attempt, SlH – self-harm, VcB – victim of bullying (childhood), VcV – victim of violence (childhood), WrP – worse performance at work/school

Crime/violent propensity: AlP – problematic alcohol use, DrP – problematic drug use, Exp – expelled from school, HrO – desire to hurt others, , JvA – juvenile arrest, NVO – non-violent offence, PrA – perpetrator of domestic abuse, VlC – violent as a child, VlO – violent offence

Exposure: AwE – known someone who has extremist views, CmE – extremism in their community, DrT – witnessed direct threats of political violence, ExF – chooses to spend time with extremists friends, ExP – chooses to spend time in places where there is extremism, F2F – face-to-face interactions with extremists, OfP – received propaganda (offline), OnP – received propaganda (online), OnS – searches online for extremist content, PrE – engaged with (read or distributes) extremist propaganda, VrI – virtual interactions with extremists, VerS – witnessed verbal statements in support of violent political action

Interpersonal: Dgr – degraded or humiliated, Dsr – disrespected, Hlp – felt like a helpless victim, Hrm – harmed by someone's negligence, Ign – ignored by someone important to them, NtC – not cared for by someone important,
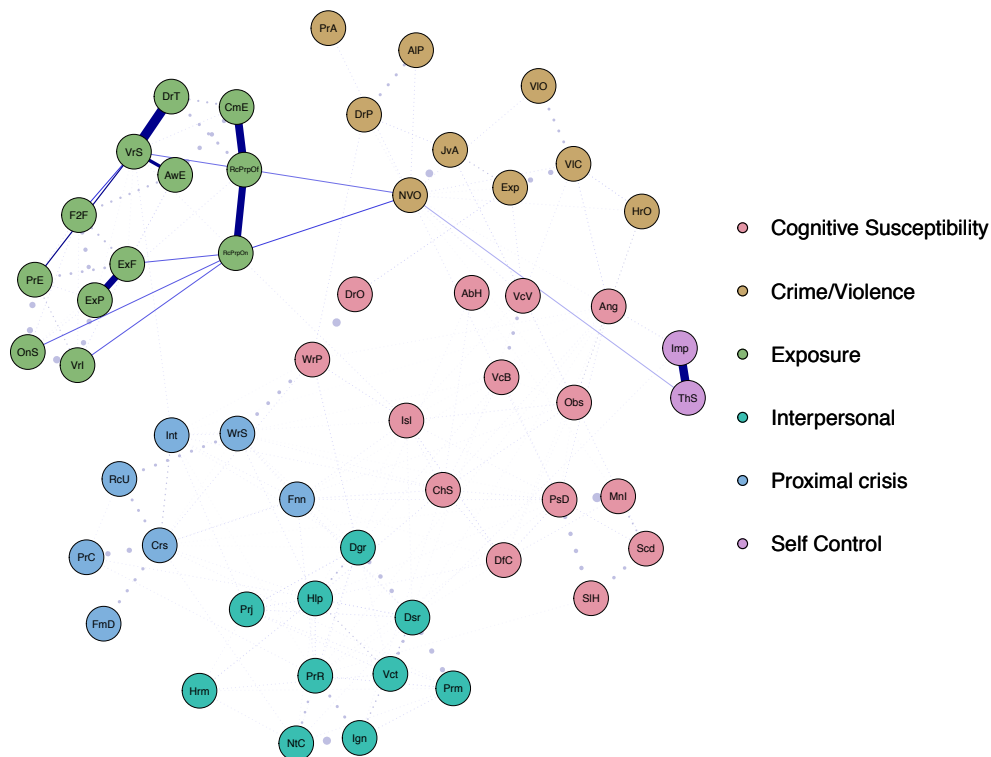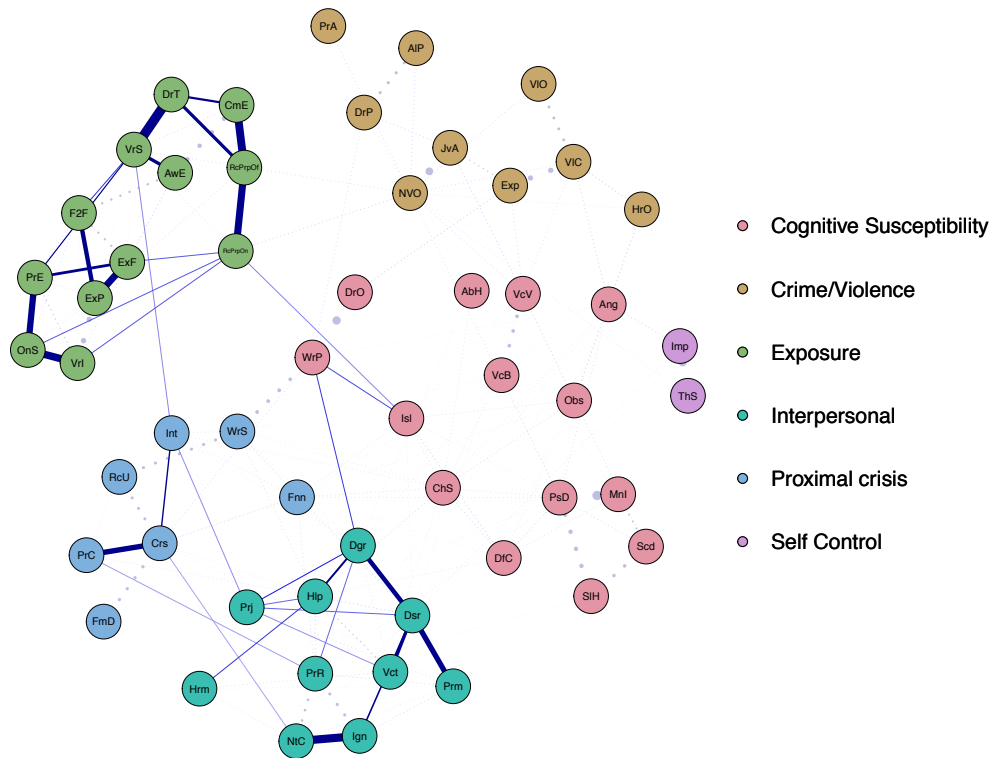
Prj – prejudice or injustice, Prm – promise broken or lied to, PrR – problematic personal relationships, Vct – victim of verbal or physical assault
Proximal crisis: Crs – proximal crisis, FmD – death in the family, Fnn – financial problems, Int – goal interrupted, PrC – proximate life change, RcU – recently unemployed, WrS – work stressor
Self-control: Imp – impulsive, ThS – thrill-seeking

Figure 6.6. Network analysis of risk factors and indicators associated with engagement in violent extremism. Shortest path from crime and/or violence supportive morality to exposure highlighted.

Figure 6.7 highlights pathways between self-control and exposure. Disaggregating thrill-seeking and impulsivity from self-control allows for the modelling of potentially differential effects. Here, *thrill-seeking* is a risk factor for exposure via *non-violent offending*, a potential mediator. This accords with previous findings about thrill-seeking and exposure to violent extremism (Clemmow & Gill, under review).

Cognitive susceptibility: AbH – grew up in an abusive home, Ang – anger management problems, ChS – chronic stress, DfC – difficulties coping with change, DrO – dropped out of school/university, Isl – isolated, MnI – diagnosed mental disorder, Obs – obsessive thinking, PsD – psychological distress, Scd – suicide attempt, SlH –

self-harm, VcB – victim of bullying (childhood), VcV – victim of violence (childhood), WrP – worse performance at work/school

Crime/violent propensity: AlP – problematic alcohol use, DrP – problematic drug use, Exp – expelled from school, HrO – desire to hurt others, , JvA – juvenile arrest, NVO – non-violent offence, PrA – perpetrator of domestic abuse, VlC – violent as a child, VlO – violent offence
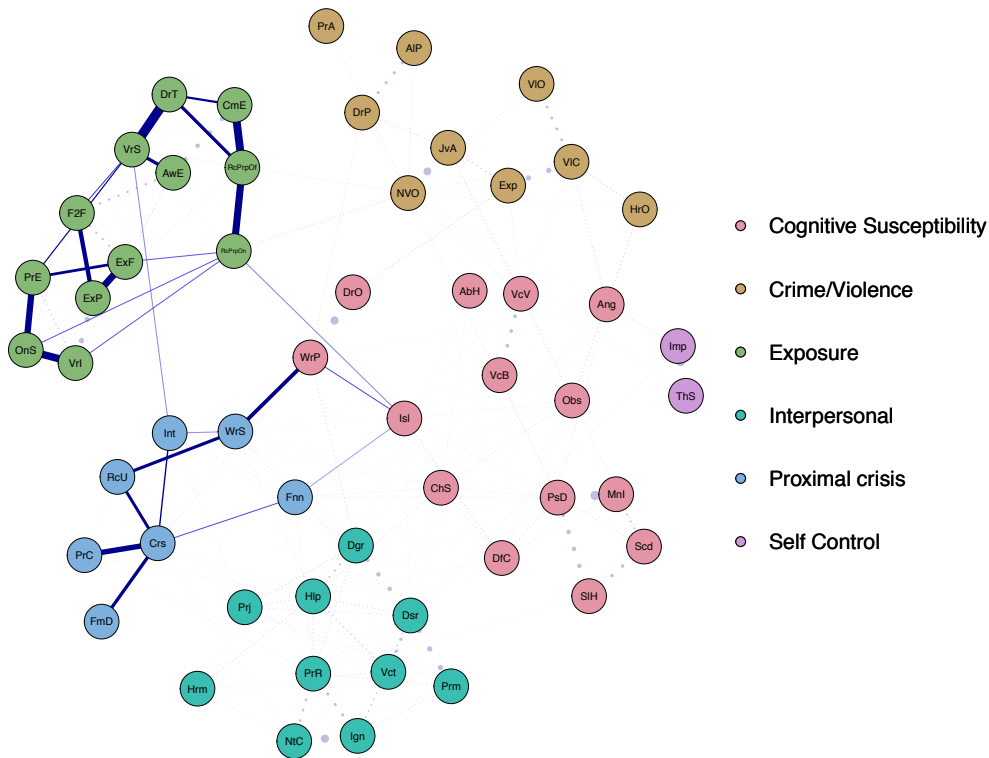
Exposure: AwE – known someone who has extremist views, CmE – extremism in their community, DrT – witnessed direct threats of political violence, ExF – chooses to spend time with extremists friends, ExP – chooses to spend time in places where there is extremism, F2F – face-to-face interactions with extremists, OfP – received propaganda (offline), OnP – received propaganda (online), OnS – searches online for extremist content, PrE – engaged with (read or distributes) extremist propaganda, VrI – virtual interactions with extremists, VerS – witnessed verbal statements in support of violent political action

Interpersonal: Dgr – degraded or humiliated, Dsr – disrespected, Hlp – felt like a helpless victim, Hrm – harmed by someone's negligence, Ign – ignored by someone important to them, NtC – not cared for by someone important, Prj – prejudice or injustice, Prm – promise broken or lied to, PrR – problematic personal relationships, Vct – victim of verbal or physical assault

Proximal crisis: Crs – proximal crisis, FmD – death in the family, Fnn – financial problems, Int – goal interrupted, PrC – proximate life change, RcU – recently unemployed, WrS – work stressor

Self-control: Imp – impulsive, ThS – thrill-seeking

Figure 6.7. Network analysis of risk factors and indicators associated with engagement in violent extremism. Shortest path from goal interrupted to exposure highlighted.

Figures 6.8 and 6.9 display shortest paths between interpersonal stressors, proximal crisis, and exposure nodes, respectively. The pathways reiterate the importance of *goal interruption* and *isolation*, again as potential mediators.

Cognitive susceptibility: AbH – grew up in an abusive home, Ang – anger management problems, ChS – chronic stress, DfC – difficulties coping with change, DrO – dropped out of school/university, Isl – isolated, MnI – diagnosed mental disorder, Obs – obsessive thinking, PsD – psychological distress, Scd – suicide attempt, SlH – self-harm, VcB – victim of bullying (childhood), VcV – victim of violence (childhood), WrP – worse performance at work/school

Crime/violent propensity: AlP – problematic alcohol use, DrP – problematic drug use, Exp – expelled from school, HrO – desire to hurt others, , JvA – juvenile arrest, NVO – non-violent offence, PrA – perpetrator of domestic abuse, VlC – violent as a child, VlO – violent offence

Exposure: AwE – known someone who has extremist views, CmE – extremism in their community, DrT – witnessed direct threats of political violence, ExF – chooses to spend time with extremists friends, ExP – chooses to spend time in places where there is extremism, F2F – face-to-face interactions with extremists, OfP – received propaganda (offline), OnP – received propaganda (online), OnS – searches online for extremist content, PrE – engaged with (read or distributes) extremist propaganda, VrI – virtual interactions with extremists, VerS – witnessed verbal statements in support of violent political action

Interpersonal: Dgr – degraded or humiliated, Dsr – disrespected, Hlp – felt like a helpless victim, Hrm – harmed by someone's negligence, Ign – ignored by someone important to them, NtC – not cared for by someone important, Prj – prejudice or injustice, Prm – promise broken or lied to, PrR – problematic personal relationships, Vct – victim of verbal or physical assault

Proximal crisis: Crs – proximal crisis, FmD – death in the family, Fnn – financial problems, Int – goal interrupted, PrC – proximate life change, RcU – recently unemployed, WrS – work stressor

Self-control: Imp – impulsive, ThS – thrill-seeking

Figure 6.8. Network analysis of risk factors and indicators associated with engagement in

violent extremism. Shortest path from interpersonal problems to exposure highlighted.

Cognitive susceptibility: AbH – grew up in an abusive home, Ang – anger management problems, ChS – chronic stress, DfC – difficulties coping with change, DrO – dropped out of school/university, Isl – isolated, MnI – diagnosed mental disorder, Obs – obsessive thinking, PsD – psychological distress, Scd – suicide attempt, SlH – self-harm, VcB – victim of bullying (childhood), VcV – victim of violence (childhood), WrP – worse performance at work/school

Crime/violent propensity: AlP – problematic alcohol use, DrP – problematic drug use, Exp – expelled from school, HrO – desire to hurt others, , JvA – juvenile arrest, NVO – non-violent offence, PrA – perpetrator of domestic abuse, VlC – violent as a child, VlO – violent offence

Exposure: AwE – known someone who has extremist views, CmE – extremism in their community, DrT – witnessed direct threats of political violence, ExF – chooses to spend time with extremists friends, ExP – chooses to spend time in places where there is extremism, F2F – face-to-face interactions with extremists, OfP – received propaganda (offline), OnP – received propaganda (online), OnS – searches online for extremist content, PrE – engaged with (read or distributes) extremist propaganda, VrI – virtual interactions with extremists, VerS – witnessed verbal statements in support of violent political action

Interpersonal: Dgr – degraded or humiliated, Dsr – disrespected, Hlp – felt like a helpless victim, Hrm – harmed by someone's negligence, Ign – ignored by someone important to them, NtC – not cared for by someone important, Prj – prejudice or injustice, Prm – promise broken or lied to, PrR – problematic personal relationships, Vct – victim of verbal or physical assault

Proximal crisis: Crs – proximal crisis, FmD – death in the family, Fnn – financial problems, Int – goal interrupted, PrC – proximate life change, RcU – recently unemployed, WrS – work stressor

Self-control: Imp – impulsive, ThS – thrill-seeking

Figure 6.9. Network analysis of risk factors and indicators associated with engagement in

violent extremism. Shortest path from interpersonal problems to exposure highlighted.

6.5 Discussion

The present study is the first to apply the network framework to terrorism. A general aim of the chapter was to demonstrate the utility of a network approach to violent extremism, and more broadly, crime in general. More specifically, the findings provide data-driven evidence for the conceptualisation of risk as the outcome of a dynamic, interactional system. Identifying pathways to exposure highlights a number of potential drivers and mediators which future confirmatory research may wish to consider. In this section I first discuss the results from the overall network graph. Second, I discuss the identified pathways to exposure. Third, I consider the practical implications of the present findings, particularly in terms of a public health approach to tackling violent extremism.

6.5.1 A network approach to violent extremism

The present study characterises risk factors and indicators for engagement in violent extremism as a complex system, where factors interact and *cause* each other in a network structure. As previously described, and similar to the approach employed in chapter 3, network analysis is model free and driven by the data. In this way, it is a useful tool to model theoretical constructs and how they may relate to each other, without introducing researcher inference.

More specifically, the results disaggregate communities of nodes which map onto mechanisms theorised by the RAF. For the purpose of the PEP typology, and in previous work (Corner et al., 2019), researchers operationalised these mechanisms with existing behavioural indicators collated by Gill et al. (2014). This was based on guidance from the RAF as well as inference. Hence it is promising to see these constructs emerge naturally in different samples (both offending and non-offending). This provides support for previous

operationalisations of the RAF and provides further empirical support for the framework as a tool for risk analysis.

In terms of node importance, *being disrespected, psychological distress*, and *non-violent offending* were identified as the most central nodes. In other words, changes in these nodes would result in the most change across the entire network. Supressing these nodes may therefore also 'dismantle the network.' This is not unexpected as being disrespected relates more generally to forming a grievance; a known driver of the motivation to engage in terrorism (Piazza, 2017; Ravndal, 2018). The role of psychological distress too, has been widely researched and implicated in pathways to engagement to terrorism (Corner & Gill, 2019; Corner et al., 2016; Corner, Gill, Schouten, & Farnham, 2018). Past offending similarly is both a common behavioural correlate of extremism (LaFree et al., 2018), as well as an indicator of a crime and/or violent propensity (Bouhana, 2019). Important nodes in a network may be useful targets for intervention (Borsboom & Cramer, 2013). I discuss this in more detail later in terms of the practical implications of these findings.

Community detection identified 6 communities. Communities relating to propensity (cognitive susceptibility and crime/violent propensity) and situation (interpersonal stressors and proximal crisis) were highly interconnected. This accords with previous calls for research to consider the compounding effect of multiple risk factors (Gill, 2015), or a pathways approach (Horgan, 2014) to understanding engagement in violent extremism. Simply, there is likely no single driver of extremism, rather it is the crystallisation of personal and situational characteristics, converging in time and space, which results in the emergence of the motivation to engage in terrorism (Bouhana, 2019; Gill, 2015; Horgan, 2014). The overall network graph visualises this.

In contrast, propensity and situation communities demonstrated less connectivity with the exposure community. Given that terrorism is a low base rate event, this makes sense.

Activation of the exposure community is not widespread. Instead, the present findings

suggest how the configurations of personal and situational risk factors (which in chapter 5 are

notably prevalent across the general population), may drive active or passive exposure (and

vice versa). I elaborate upon this next, as I discuss in more detail the detected pathways to

exposure.

6.5.2 Pathways to exposure

The pathways to exposure presented here resonate with the PEP typology outlined in

chapter 3, as well as with previous research on terrorism, and violence in general. The PEP

typology articulates trajectories to committing lone-actor violence; the present study

examines pathways to exposure. As previously stated, exposure may be an observable

behavioural proxy for belief formation, engagement, and even the emergence of the

motivation to act. Moreover, the role of exposure in trajectories to committing terrorist

violence is key (Taylor & Horgan, 2006; Wiktorowicz, 2004). The drivers of exposure in fact

may have direct relevance to developing the motivation to act. Hence it is relevant to

compare the PEP typology to the exposure pathways presented here.

The results suggest that a criminal and/or violent propensity may be a driver of

exposure. The selection PEP presented as a pattern of indicators relating to committing crime

and/or violence, alongside low frequencies of situational stressors, or indicators related to a

cognitive susceptibility. The present results similarly highlight a direct 'route' from past

violent and non-violent offending to exposure.

Previous criminality, including past violence is often a predictor of extremism. For

instance, Coid et al. (2016) conducted a general population survey of 3, 679, 18-34 year old

men in the UK. They found significant positive associations with drug misuse, previous

criminal behaviour, previous violence, and extreme pro-British views. Previous violence and

past imprisonment were associated with extreme anti-British views. Research on violence in general consistently reports past criminal behaviour, including violence, as a reliable predictor of future violence. For example, in a prospective longitudinal study of 411 South London young males, Farrington (2001) found that past convictions for non-violent crimes predicted adult violence better than past convictions for future violence. Equally, past antisocial behaviour indicated risk for future violence. In the present study, non-violent offending was identified as an important node; both in terms of strength, and bridge strength. Particularly noteworthy are the node's connections to exposure.

Selection is described as a mechanism for exposure (Bouhana, 2019). In terms of self-selection, offenders with a proclivity for crime and or violence may choose to spend time with people, or in places, both online and offline, that promote terrorist morals norms. This may be one explanation for the interaction between *non-violent offending, witnessing verbal statements in support of violent action*, and *receiving propaganda online*. In terms of social selection, person-specific characteristics may dictate the types of spaces (online and offline), where individuals spend time. In this way, previous criminality may be a social selection factor. Equally, an individual's history of offending may be related to the same social selection factors that drive exposure, i.e. ethnicity, socioeconomic status, religion, and so on.

The susceptible PEP demonstrated high frequencies of indicators related to impaired higher functioning including psychological distress, diagnosed mental disorder, and adverse childhood experiences. Differing patterns of situational stressors and exposure indicators were observed. Pathway analysis of the shortest paths from cognitive susceptibility to exposure revealed similarly. Cognitive susceptibility nodes connect to exposure via situational and crime and/or violent propensity nodes; visualising the equifinality of pathways to exposure.

Interestingly, in terms of mental illness and psychological distress, there is no direct 'route' to exposure. This is concordant with Corner et al.'s (2019) state transition diagrams which suggest that mental disorder likely impacts upon trajectories differently, at different points during the offence commission process. Corner et al. (2018) summarise the evidence base for mental disorders, personality traits, and grievance-fuelled targeted violence. They summarise that "(E)xamination of different disorders, situations, demographics, along with unique experiences provide more rounded answers regarding attribution of mental disorder to criminal and violent behaviour" (Corner el at ., 2018; 460).

Nuanced research such as Monahan et al. (2001) too moves beyond simplistic explanations and analyses how multiple factors such as past violence, previous criminality, adverse childhood experiences, and situational influences, interact with diagnosed mental disorder and personality traits, to result in violent behaviour. In other words, how mental disorder may drive violence in *some* circumstances, for *some* people. In addition to the cognitive susceptibility-exposure pathway presented here, findings similar to Monahan et al. (2001) can be seen in the overall graph. How mental disorder may drive exposure (a necessary precursor for violence), in different people, under different circumstances, is illustrated by the numerous routes from nodes related to poor mental health, to exposure. In general, the results echo calls from Corner and colleagues for a more nuanced approach to understanding the role of mental disorder in violent extremism. Specifically, the present findings highlight a number of potential mediators to consider for future research and possibly when designing interventions.

Lastly in terms of cognitive susceptibility, isolation appears an important node. Self-reported isolation was also a relatively important bridge node. The inverse, social support, is an important protective factor in violent extremist research. Milla and Hudiyana (2019) conducted structured interviews with 241 prisoners serving sentences for terrorism offences

in Indonesia. They found that the higher the breadth of relationships with people outside the terrorist group, the lower the commitment to the radical group. Similarly, Rousseau et al.'s (2019) Canadian survey found those high in perceived social support scored lower in violent extremist sympathies. High social support also managed to buffer the impact of other risk factors positively associated with violent extremist sympathies such as perceived discrimination. Cardeli et al's (2020) analysis of 542 Somali Refugees in the United States also demonstrates the mediating role of social bonds upon adversity and radicalisation. The present results suggest again that isolation, or conversely social support, may be an important mediator of cognitive susceptibility risk factors and exposure.

The shortest path from self-control to exposure highlights thrill-seeking as a potential driver of exposure. Previous research reports thrill-seeking is associated with aggression and crime/delinquency (Wilson & Scarpa, 2011; Burt & Simons, 2013; Eysenck & Eysenck, 1978; Hansen & Breivik, 2001; Horvath & Zuckerman, 1993; Pfefferbaum & Wood, 1994). Hence it follows that thrill-seeking may be an important driver of exposure. The association among thrill-seeking, non-violent offending, and exposure, reiterates the findings of previous research.

Conceptualised as sensation-seeking, venturesomeness, or risk-seeking, thrill-seeking can account for differential attitudes towards risk-taking. Specifically, individuals' attitudes differ as a function of thrill-seeking, where thrill-seeking relates to the amount of pleasure they receive (or anticipate receiving) from the psychological and physiological sensations inherent in risk-taking (Burt & Simons, 2013). Research on extremism widely acknowledges the role of thrill-seeking in pathways to violent extremism, as discussed in the previous chapter (Horgan, 2003; Kruglanski, Jasko, Chernikova, Dugas, & Webber, 2018; Victoroff, 2005). Many extremist risk assessment tools also consider the role of thrill-seeking in violent extremist risk. For instance, the VAF (Home Office, 2012), the ERG 22+, and the VERA-2R

(Lloyd & Dean, 2015). Articulating the role of thrill-seeking in exposure may help specify *how* some come to seek out engagement with extremism.

Pathways from nodes conceptualised as relating to situational influences present similarly to the situational PEP. The situational PEP suggested acute stress and wider situational influences may be key to the emergence of the motivation to act; seemingly in the absence of a cognitive susceptibility or pre-existing crime/violent propensity. The two situational pathways to exposure presented here conclude similarly. Routes to exposure absent of interactions with more distal risk factors are evident. An analysis of person-exposure patterns in 183 US lone-actor grievance-fuelled violence offenders disaggregated two similar clusters of situational stressors in an offending sample; labelled high stress (social) and high stress (interpersonal) (Clemmow et al., 2020). Hence it may be important to consider the influence of situational factors in the absence of more distal, compounding risk factors as drivers of exposure. Next I consider the practical implications of the present findings.

6.5.3 Practical implications

A network approach to violent extremism presents further evidence for conceptualising risk factors and indicators for engagement in violent extremism as a dynamic system. This has important practical implications and provides support for both a SPJ approach to terrorist risk assessment (Logan & Lloyd, 2019; Monahan, 2012; 2016) and a multi-agency and/or public-health approach to preventing violent extremism.

As previously described in chapter 3, an SPJ approach to terrorist risk assessment draws together knowledge on evidence-based risk factors, with experience and theory-informed judgements (Logan & Lloyd, 2019; Monahan, 2012, 2016). Given the multifinality of risk factors and the equifinality of pathways to engagement in violent extremism, such an

approach may be more stable grounds for risk assessment than actuarial-based risk assessment tools. The present network analysis provides further evidence for adopting a robust analytical framework, such as the RAF, and conceptualising risk as the outcome of multifactorial interactions, rather than relying on prevalence rates of static indicators.

More generally, the results provide further support for a multi-agency and/or public health approach to tackling violent extremism. For instance, multi-agency hubs across the UK, part of the UK's CONTEST strategy, specifically the PREVENT arm, take a collaborative approach to understanding and developing approaches to risk management. They look beyond the presence or absence of single risk factors and formulate multi-agency responses to complex problems (Home Office, 2018). FTAC and QFTAC take a similar approach (albeit specifically focussed on mental health) among the pathologically fixated and grievance-fuelled violence offenders in general (Pathé et al., 2018). Pathé et al. (2018; 48) describe how "(T)traditional counter-terrorist policing methods cannot ameliorate this multi-factorial problem, but inter-agency cooperation and skill sharing can enhance current efforts."

Bhui, Hicks, Lashley and Jones (2012) similarly advocate for a public health approach. They argue that criminal enforcement alone has proven ineffective and interventions that target the most vulnerable are more effective. Bhui et al. (2012) propose four steps: 1) comprehensively define the problem 2) establish risk and protective factors which can be modified through interventions, 3) establish 'what works' through designing, implementing, and evaluating interventions, 4) implement effective interventions in a range of settings and evaluate their impact. The present findings have relevance here as a network approach not only articulates the interactions among risk factors for violent extremism, but also identifies potential mediators which may be useful targets for intervention.

A public health approach to violent crime in Scotland has largely been viewed as successful, with calls for London to implement a similar strategy to tackle a growing knife

crime problem (Torjesen, 2018). Advocates suggest implementing the 'Scottish model' to identify those most vulnerable and improve their immediate situation, whilst inoculating the general population through education and changing social norms. In terms of extremism, taking a public health approach and identifying those most vulnerable, early on, and implementing evidenced-based interventions, may 'deactivate' some of the drivers of violent extremism, thus 'dismantling the network.' This may have far wider reaching outcomes in terms of public health in general, not only in terms of violent extremism or crime.

6.5.4 Limitations and future research

It is important to consider the limitations of the present study when considering any practical implications. First, I reiterate the need to consider the limitations of Prolific. I discuss these at length in chapter 4 and 5. However, Prolific provides researchers with new opportunities to engage, quickly, with global populations, at a relatively low cost, and is potentially a promising tool for a field which succumbs to such issues with data availability.

As in previous chapters, the data were self-reported. Doing so is undoubtedly subject to biases. However, as Gomes et al. (2019) summarise, no research design will be absent of biases. Chapter 4 suggested that direct questioning with Prolific users may elicit more truthful (and usable) data than indirect questioning. Hence, I employed direct questioning in the present study. This is still likely to be subject to self-reporting biases.

Considering network analysis, the present study was exploratory. One way to consider the results of network analysis is as hypothesis *generating*. It is necessary to a) replicate these findings in novel samples, and b) conduct confirmatory hypothesis testing. The reliability and accuracy of network analysis is also important to attend to. Whilst the metrics presented here suggest moderate reliability and accuracy, without replication, any findings and their subsequent interpretation should remain tentative.

Lastly, the sample was drawn from the general population which may have implications for how applicable the present findings are to offending samples. This is often an issue considered in psychopathology where researchers model networks of symptoms in both clinical and non-clinical samples. Ideally, future research should replicate the present study with an offending sample. Unfortunately, this was not feasible here. However, extremism is not a dichotomy. Taking a dimensional approach, gradations of extremism are likely observable within the general population. With respect to early interventions in fact, important insights into who may be most vulnerable may be gleaned from work with general population samples.

6.6 Conclusion

The network framework has gained popularity in the psychological sciences. There are opportunities for researchers studying crime and violence to apply this novel approach to how we understand criminal behaviour. One interesting application to consider is how person-specific individual networks may help practitioners formulate treatment plans. For instance, in terms of psychopathology, a single patient's symptoms may be modelled as a network to help a clinician make decisions about appropriate treatment and intervention opportunities. This may equally be relevant to consider for practitioners working in forensic settings who need to articulate a case formulation for guiding treatment and intervention, tailored to the individual.

Time series networks could also prove an interesting avenue for future research. Analysis of time series data in terrorism studies is limited, given the obvious challenges. However, the work presented in this thesis utilising general population samples may suggest a route forward. Collecting time series, or panel data, among a general population sample, is feasible. Such data can then be modelled as time series networks. These graphs are directed

and may provide further insight into how risk factors cause and relate to each other, over time. Such work among offending samples could be an important research endeavour.

The present results not only visualise the dynamic system theorised to underpin terrorist risk but provide further support for the PEP typology outlines in chapter 3. Early on in this thesis I presented evidence for the field progressing beyond a profiling approach. Novel research designs demonstrate the complexity of terrorist risk (Corner et al., 2019). Equally, the evolution of preventative programs towards a public health approach alludes to a practical need to model complexity. The present findings suggest that a network approach may be one way to do so, whilst affording researchers more nuanced insight into a complex and heterogenous population.

7. Thesis Conclusion

This chapter summarises the results of the present body of work, presents further limitations to consider, and discusses some broad directions for future research.

7.1 Discussion of findings

The aim of this thesis was to contribute towards our developing understanding of risk factors and indicators associated with engagement in violent extremism. A review of the literature highlighted two key opportunities to do so. First, the multifinality of risk factors poses a challenge for reliably measuring risk. Specifically, the utility of actuarial risk assessment tools in particular may be limited, given the absence of any terrorist 'profile.' It was suggested that one way to address the challenges presented by multifinality is to move beyond static profiles of risk factors, and instead seek to understand the causal mechanisms that *patterns* of these factors may speak to. Doing so may be one way to more reliably assess risk, particularly in terms of an SPJ approach to risk management where professionals make evidence-based decisions and judgements on a case-by-case basis. Hence this body of work sought to disaggregate *configurations* of risk factors, and tie these to the processes theorised to drive the phenomenon, in both offending (chapter 3) and non-offending (chapter 6) samples.

However, without understanding base rates it remains unclear to what extent seemingly pertinent risk factors occur normally across a general population. Again, this is particularly relevant to risk assessment. Reliable general population base rate estimates provide evidence to inform judgements about what might be expected normally, and what might signal the need for intervention. This thesis undertook the first steps towards developing general population base rate estimates of risk factors and indicators for engagement in violent extremism. Finally, applying a process approach, the network

framework was implemented to visualise relations among general population base rate estimates as a dynamic, interactional system.

Specifically, chapter 3 presented a reconceptualisation of engagement in lone-actor violent extremism, articulating how different person-situation interactions could be disaggregated from a population of solo terrorists. The four PEPs (*solitary, susceptible, situation*, and *selection*) demonstrate how differential individual-level susceptibilities interact with situation and exposure indicators in pathways to lone-actor violence. The results articulate patterns of indicators which suggest different 'styles of interaction,' rather than 'types' of people. Drawing from the RAF as analytical guidance, the four styles of interaction are explicated in terms of the theorised causal processes which may drive the emergence of the motivation to act. However, again, without understanding base rates, the practical utility of these findings may be somewhat limited.

However *how* to generate base rates estimates was equally important to consider. Therefore, chapter 4 undertook a test of survey methods. Two questioning designs, direct and indirect (UCT) were compared. The results suggest that, under the conditions described in chapter 4, direct questioning was the most appropriate, where indirect questioning resulted in deflation effects and somewhat nonsensical estimates. This has important implications for future research in terrorism studies, and beyond, as it provides tentative evidence for the use of direct questioning designs among samples who may truly trust their anonymity (such as those who operate online, or in the absence of an interviewer). Direct questioning designs have a number of advantages, namely resulting in subject-level disaggregated data, rather than aggregate sample proportions, for which multivariate statistical analysis is not possible.

Employing the results from chapter 4, chapter 5 compared the general population sample with an offending sample of lone-actor terrorists. A number of key differences were observed: 1) lone-actor terrorists demonstrated propensity indicators related to a cognitive

susceptibility, and a crime- and/or violent propensity more often; the general sample demonstrated protective factors more often, 2) lone-actor terrorists demonstrated situational indicators related to a crime- and/or violent propensity more often, whereas the general sample experienced situational stressors more often, and 3) lone-actor terrorists demonstrated indicators related to exposure to extremism more often. The results highlight measurable differences in the prevalence of risk factors between lone-actor terrorists and the general population.

However, chapter 4 and 5 largely concentrated on the prevalence rates of single factors. This is important, particularly in providing evidence for (or against) pertinent risk factors employed in risk assessment tools. However, akin to chapter 3, modelling the relations *between* these factors was suggested as a way to understand the emergence of risk as a product of a complex, dynamic system. Again, doing so may be one way to not only account for, but model, the multi- and equi-finality observed across existing research.

Hence, chapter 6 introduced psychometric network modelling as a way to visualise the multiple interactions among risk factors associated with engagement in violent extremism. Broadly, the results highlight the utility of applying a network approach to model complexity. More specifically, the resultant network graphs tangibly visualise how risk may emerge as the result of mutually reinforcing interactions among propensity, situation, and exposure risk factors. I suggest several risk and/or protective factors which may be useful for future research to consider as mediators in confirmatory research designs, as well as possible targets to intervene upon when designing and implementing interventions tackling violent extremism.

7.2 Limitations

Research on terrorism consistently succumbs to many of the limitations described in chapter 2, particularly given the somewhat unique challenges encountered by terrorism researchers. This is often unavoidable (to some extent) and in the pursuit of progress, research persists. Such progress is evident however it is important to be transparent about the limitations of research, and to consider these when evaluating the practical implications of any findings. There are important limitations outlined throughout this thesis, however this section considers some broader caveats to bear in mind.

One such limitation to consider is small sample sizes. Specifically, the offender data employed here, although a population (within the stated parameters), is a small sample. Considering other examples of crime such as burglary, or homicide, much larger sample sizes are afforded to researchers given the relative prevalence of these offences. Terrorism is inherently a low base rate offence and as such, small samples are somewhat unavoidable. One way forward may be to consider incorporating insights, and even data, from analogous offenders.

For instance, studies have examined the conceptual boundaries between different lone-actor grievance-fuelled offenders. These include comparisons of suicide terrorists with rampage, workplace, and school shooters (Lankford, 2013), suicide terrorists with mass shooters (Lankford, 2016, 2018; Lankford & Hakim, 2011), ideologically and non-ideologically motivated mass shooters (Capellan & Anisin, 2018), political and non-political murderers in Northern Ireland (Lyons & Harbinson, 1986), adolescent targeted school attacks with jihadi terrorists in Germany (Böckler et al., 2018), both far-right homicides (Gruenewald, 2011; Gruenewald & Pridemore, 2012), and European lone-actor terrorists with common homicides (Liem et al., 2018), and lone-actor terrorists with mass murderers (Capellan, 2015; Gill et al., 2014; Horgan, Gill et al., 2016).

Studies consistently report similar profiles of psychological and social characteristics, providing evidence for reconceptualising these offenders as lone-actor grievance-fuelled violence offenders, rather than as distinct 'types' (Clemmow, et al., 2020; Horgan, Gill et al., 2015). Hence it may be reasonable to combine data from across the spectrum of grievance-fuelled violence. Doing so may afford researchers insights from analyses of larger samples that span these blurred conceptual boundaries (Gill, Marchment & Clemmow, under review). This would have its own limitations however is interesting to consider.

Similarly, over reliance on open source data is consistently identified as problematic among terrorism research. Notable limitations such as the availability bias have important implications when evaluating the implications of the present findings. However, the field is limited by what data is made available. Great strides have been made in the availability of robust, open-source data, such as the Extremist Crime Database (Freilich, et al., 2006) and the Global Terrorism Database (Lafree, Dugan, Fogg & Scott, 2006). Such endeavours provide researchers with opportunities to access data not typically afforded to early terrorism scholars. However, some note that problematic data collection methodologies may result in less reliable data (Sageman, 2008). Hence, it is necessary for researchers to make certain choices, and subsequently to be transparent about the limitations of these. In the present instance, ideally, afforded access to a large enough offending population, it would be beneficial to deliver the Base Rate Survey to an offender sample, for example. However, this was not feasible, currently. Afforded the opportunity in the future, researchers should consider doing so.

7.3 Directions for future research

Much of this thesis is exploratory, the results of which may be considered as hypotheses generating. Hence, I conclude with a number of recommendations for future

research. Research should seek to replicate the findings presented here. Doing so is important to establish a reliable evidence base. Evaluations of empirical evidence in terrorism studies are often difficult given the lack of systematic empirical research. Reproducing key findings is therefore an important research agenda to consider when advocating for an evidence-based approach to counterterrorism (LaFree et al., 2018).

As discussed, utilising primary source data may be beneficial when faced with the limitations of relying overly on secondary source data. Although notably, Gill, et al. (2019) found comparable results comparing the present secondary data collection methodology to results gathered from closed sources. In fact, a number of robust open-source secondary datasets are publicly available (such as the GTD and ECDB). These afford researchers the opportunity to conduct empirical research when access to closed source data remains challenging. Robust and transparent data collection methodologies can mediate many of the concerns articulated by early terrorism scholars. However, in pursuit of robustness, work with primary source data can only be beneficial to our understanding of terrorism.

Similarly, self-report data has its own inherent biases. It may therefore be useful to consider gathering observational data with both general and offending population samples, in order to a) understand the extent and nature of these biases, and b) compare the effects of different data collection methodologies when generating base rate estimates. The Base Rate Survey and general population base rate estimates are openly available on the OSF. This is to encourage open science practices and future research engagement. It is hoped that future work may benefit from accessing these resources, as research continues towards establishing a robust evidence-base for risk factors and indicators for engagement in violent extremism.

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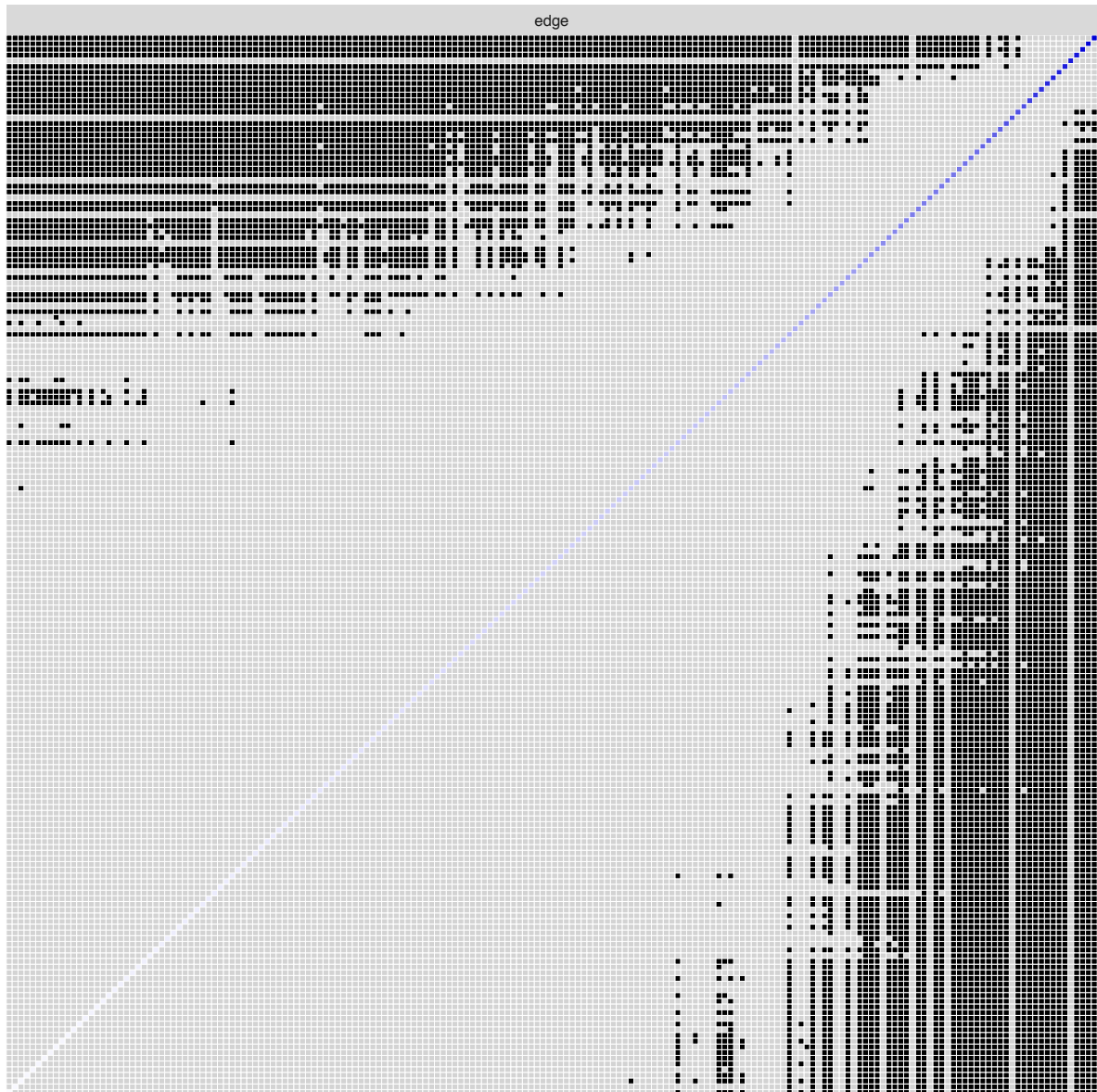
6237.2011.00770.x

Figure S1. Bootstrapped difference test between non-zero edges. Coloured squares represent edges, ordered from highest (darkest) to lowest (lightest) edge weight. Black squares indicate significant difference between edges (p < .05). grey squares indicate no significant difference. Axis have been removed to avoid cluttering.
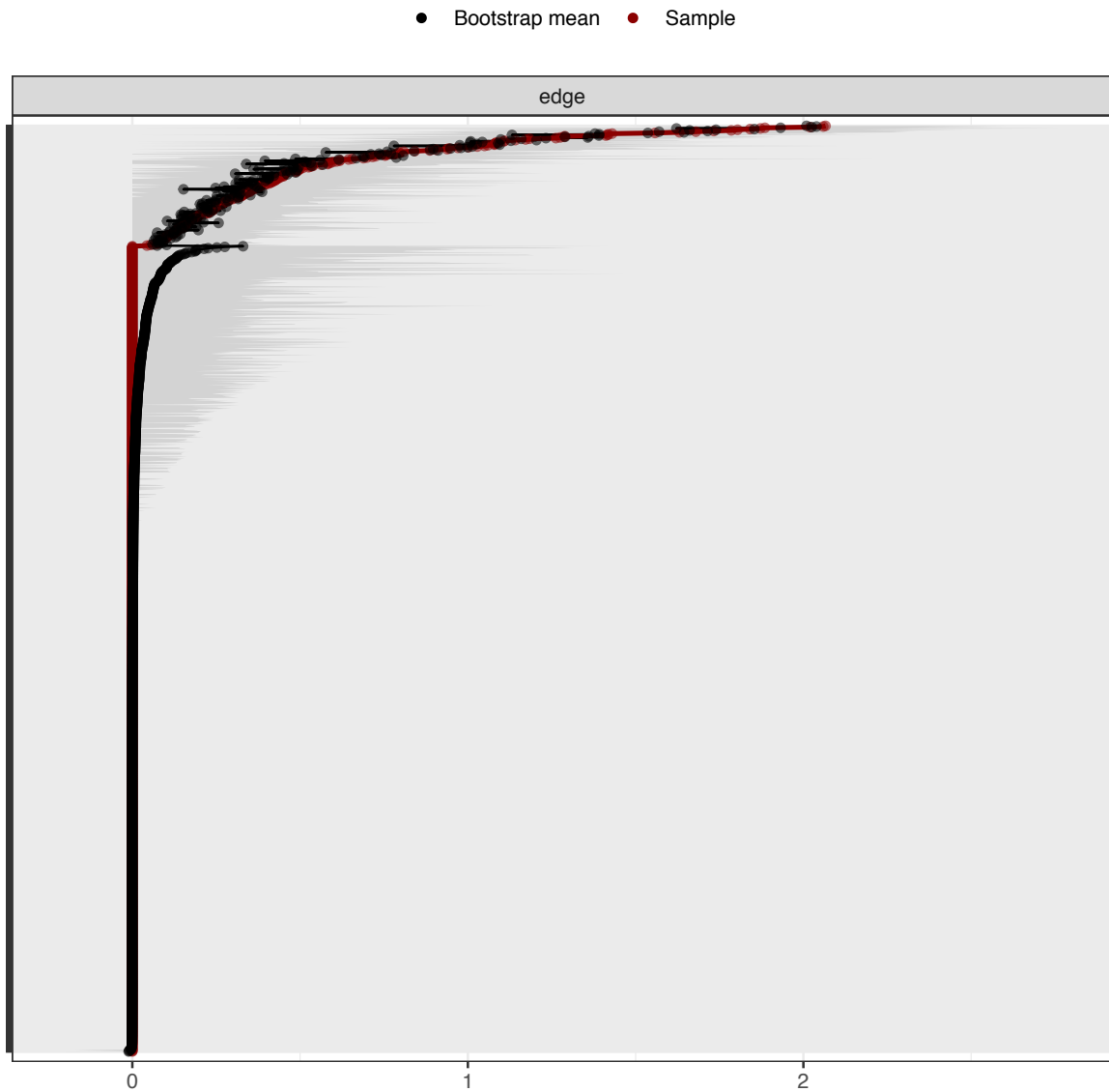
Figure S2. Bootstrapped confidence intervals of estimate edge-weights for the estimated network. The *red line* indicates the sample value and the *black line* indicates the bootstrap mean. The *grey area* indicates the bootstrapped confidence intervals. The y axis is ordered from the edge with the highest edge-weight to the edge with the lowest edge-weight. The y-axis has been removed to avoid cluttering.
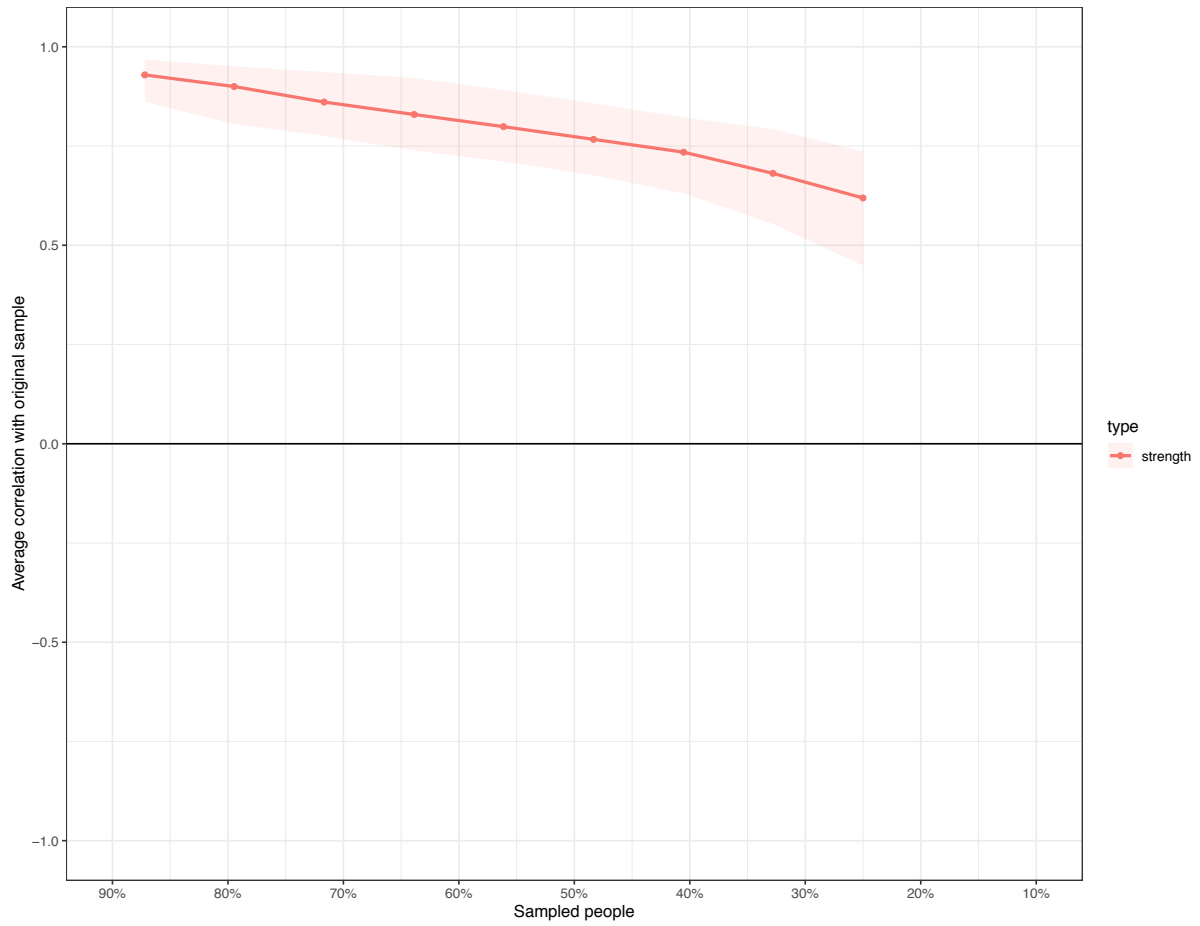
Figure S3. Average correlations between centrality index 'strength' of networks sampled with persons dropped and the original sample. The *red line* indicates the mean and the *red area* indicates the range from the 2.5th quantile to the 97.5th quantile.
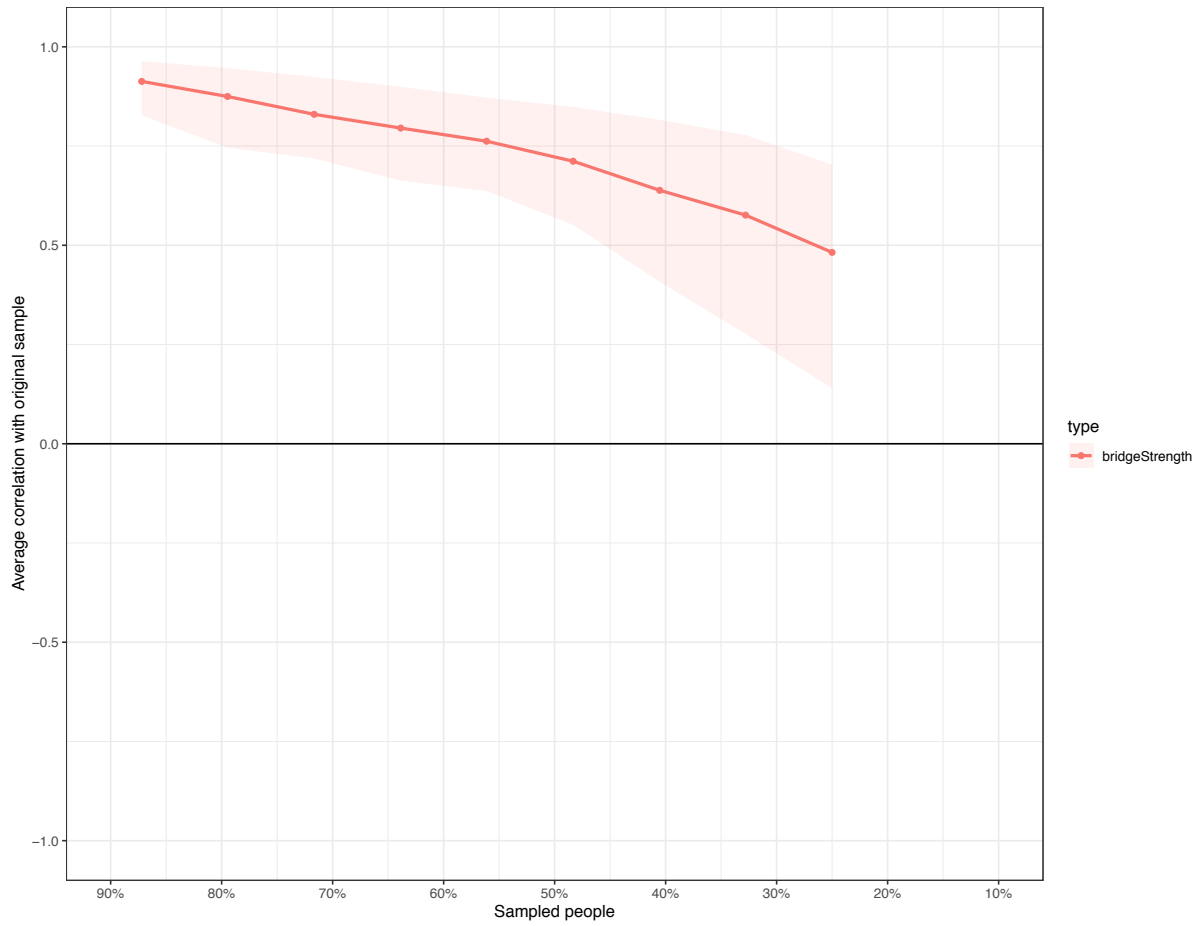
Figure S4. Average correlations between centrality index 'bridge strength' of networks sampled with persons dropped and the original sample. The *red line* indicates the mean and the *red area* indicates the range from the 2.5th quantile to the 97.5th quantile