DELIBERATE FIRESETTING: EXPLORING CRIME SCENE BEHAVIOURS AND DEVELOPING FIRESETTER TYPES

by

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Abstract

This thesis explores the firesetting crime scene behaviours and typologies of deliberate firesetters. Chapter one introduces the topic of deliberate firesetting and provides a brief overview of existing research in this area. It reflects on the potential for devastating consequences of firesetting behaviour and puts forward the earliest and current theories that attempt to explain firesetting behaviour. Chapter two contains a systematic literature review that examines six firesetter typologies and concentrates on the variables (e.g., location of fire, motivation, season etc.) used to develop typologies, as well as the firesetting populations identified and selected for inclusion in the studies. Chapter three comprises an original piece of research that aims to understand firesetting behaviours, incorporating both apprehended and un–apprehended firesetters. This is done by using Multi–Dimensional Scaling (MDS) on a sample of 9,541 deliberately set fires in West Midlands between 2016 and 2018. This research identified three firesetter types, which is partly consistent with types identified in previous typology research, but indicates that further exploration of firesetter types, including both apprehended and un–apprehended, firesetters is needed. Chapter four is the first critique of a relatively new scale, the Fire Proclivities Scale (FPS), and examines the scale's capacity to identify un–apprehended firesetters in the community. This is a promising scale, with good validity and reliability, and shows potential in its capacity to further our insight into the different traits and behaviours linked to un–apprehended firesetters. Finally, Chapter five considers the underpinning conclusions to be drawn from across the previous Chapters and considers at the theoretical and practical implications of this thesis.

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Chapter 1

Introduction to the thesis

"From the little spark may burst a mighty flame"

Dante

Why study fire?

Firesetting has been a source of fascination to humans for centuries, certainly as far back as the legend of Prometheus (8th Century) who, according to myth, brought fire to humans. Fire provides a pivotal role in supplying some of our most basic needs: comfort, safety and cooking (Prins, 1994). In sharp contrast to this, fires have the potential to cause destruction on a huge scale. One needs only to consider the Grenfell Tower or Notre Dame fires to highlight the devastating loss of life, impact on health, as well as the social and financial implications of fires. To give some context of the size of the problem created by out of control fires, around 181,436 fires were attended to by the fire service in England in the year ending September 2018, a 6% increase compared with the previous year (Department for Communities and Local Government, 2018). Just under half of these, 82,215, were deliberate fires and a perpetrator was identified in approximately only 7% of them (Department for Communities and Local Government, 2018).

The potential impact that fires can have creates impetus to develop our understanding of deliberate firesetting and thus encourages research covering a wide range of topics within firesetting. Developing a comprehensive understanding of firesetters and the risks they pose is integral to detection, treatment and risk reduction (Doley, 2003; Tyler & Gannon, 2012). Deliberate firesetting is often considered a violent behaviour and, compared to other violent offending such as sex offending or direct assault, arson is much under–researched (Doley, Dickens, & Gannon, 2016). Studies on deliberate firesetting have been influenced by research on other types of violent offending due to the perception that firesetting is an expression of anger and therefore a form of aggression (Canter & Fritzon, 1998). Accordingly, research on deliberate firesetting, like violent offending, has regarded motivations to offend and the development of an offence behaviour chain as valid areas for research (Gannon, 2016).

Comparisons drawn between these different types of violent and/or aggressive offences have led researchers of deliberate firesetting to mirror the approaches used in the violent offending literature. For example, identifying the aetiology of deliberate firesetters, examining motivation for their offending and developing theories to support understanding of deliberate firesetting (Gannon, 2016).

Firesetting has attracted research to explore the reasons for deliberate firesetting and the ways in which individuals have come to set deliberate fires. There have been different explanations for deliberate firesetters and firesetting behaviours proposed over the years (Freud, 1920; Gannon, Ó Ciardha, Doley, & Alleyne, 2012; Jackson, Glass, & Hope, 1987, etc.). Ongoing research has highlighted that deliberate firesetting is not likely to have a single aetiology or cause and that further research is required in this area to better understand firesetters (Gannon, 2016). In order to better study this topic, it is first important to develop a uniform understanding from the range of language used to describe deliberate firesetting. Below are the most frequently used words within firesetting research, their definitions and their usage within this thesis.

Definitions

The terms pyromania, arson, and firesetting, are sometimes used interchangeably, however they all have different meanings. *Pyromania* is the term used by the DSM–V to diagnose a mental health disorder and is categorised in the *disruptive, impulse control and conduct disorders* sub–group. It is "a pattern of deliberate setting of fires for pleasure or satisfaction derived from the relief of tension experienced before the fire-setting" (DSM–V, 2013 p.477). Pyromania is exceptionally rare, often cited as less than 1% of firesetting populations (Doley, 2003b) and found in only 3–6% of adult psychiatric populations according to Burton, McNiel, and Binder (2012). Pyromania is

important to acknowledge, because of its long history in informing and influencing research on firesetting.

Arson often refers to the legal definition, which in England is defined as "a person who (through the use of fire) without lawful excuse destroys or damages any property belonging to another intending to destroy or damage any such property or being reckless as to whether any such property would be destroyed or damaged" (Criminal Damage Act, 1971). However, it is also important to be aware that different countries have different definitions of arson, meaning that a person considered to be an arsonist in one country may not meet the criteria in another country. *Firesetting* is used to describe both the deliberate (including arson) and accidental act of setting a fire(s). This thesis will use the term firesetting when discussing all deliberate firesetting behaviours, whether they meet the criteria of an arson definition or not and whether or not a diagnosis of pyromania is, or would be, arrived at.

There is a recognised need to develop classifications within psychology to further our understanding and organise approaches to research (Richards, 2016). *Typologies* are a form of classification developed to aid our understanding of a topic being studied. A typology is composed of different *types*; these types are determined on the basis of psychological *traits* (Keirsey, 1998). The psychological traits are often based on particular behaviours identified in a specified activity. For example, within personality types, traits are identified (e.g., preference for communication style) which are used to classify an individual as a particular personality type (e.g., 'Guardian') (Keirsey, 1998). Considering firesetting, the development of typologies of deliberate firesetters helps organise the behaviours and traits (known collectively as 'variables') in a meaningful way, aiding further research and understanding (Canter & Almond, 2002; Gannon & Pina, 2010). This organisation can also further our understanding of

deliberate firesetters' behaviours, backgrounds and risk (Gannon, 2016). It is well-accepted within the field that the development of firesetter typologies will provide further clarity in supporting the creation of intervention programmes, improving profiling for purposes of detection and establishing risk assessments, all of which are developed through understanding deliberate firesetters types, rather than the individual deliberate firesetters (Canter & Almond, 2002; Gannon, 2016; Gannon & Pina, 2010). Detailed discussion of the existing typologies for deliberate firesetters can be found in Chapter two.

The most influential and well recognised theories are introduced below to provide the context for our current understanding of deliberate firesetting.

Making sense of firesetting: Psychological theory and methodological approaches

Freud made one of the earliest attempts to understand and explain firesetting behaviour and argued that everything to do with the making of fire is linked with sexual symbolism (Freud, 1920). He asserted that the male instinct to put out a fire by urinating, is linked to eroticism. In this way he believed deliberate firesetting was the result of aberrant psychosexual development (cited in Stockburger & Omar, 2014). Freud (1920) also stated human interactions with fire represent a 'primitive' desire to gain power and control over nature. However, there is no empirical evidence to support Freud's explanation for firesetting and more recently proposed theories have more substantial evidence base.

Social Learning Theory is a single factor theory (i.e. focusing on one factor or mechanism) that has been utilised to explain firesetting behaviour as a result of social learning and reinforcement (Gannon & Pina, 2010). It is suggested that firesetting behaviour occurs due to the individual identifying positive things, such as excitement,

derived directly from fire itself and/or thrill from attempting to tackle the fire. These positive experiences and/or outcomes are seen as reinforcing elements of the individual's firesetting behaviour and providing motivation to set deliberate fires (Doley, Dickens, & Gannon, 2016). Social Learning Theory can explain a variety of motives such as revenge, excitement of fire itself, or fire used as an expression of anger, and, therefore, has been put forward as a way to understand the precursors or direct motivations to set fires. This theory also attempts to explain why other factors, such as poor assertiveness, are found in firesetters. For example, it is suggested that having poor role models through poor parenting predisposes a firesetter to have difficulties in expressing themselves (Blumberg, 1981; Kennedy, Vale, Khan, & McAnaney, 2006). It is then suggested that emotions are expressed through the setting of a fire(s). Single factor theories (such as Social Learning Theory) are an important part of supporting our understanding of firesetting behaviours, however, they can over–simplify a very complex process and do not account for the variety of firesetting behaviours and types identified (Doley, Dickens, & Gannon, 2016). They also are based upon firesetters who are apprehended and who are able to talk through their offences with researcher or practitioners, which poses some problems (discussed in Chapters 2 and 3).

Multi–factorial theories are more comprehensive in their bid to understand and explain firesetters and their behaviours. Research has focused, historically, on understanding the traits, personality and functional analysis of firesetters, aiding the development of multifactorial theories (Blumberg, 1981). One of the early proponents of multi–factor firesetting theories was Fineman's (1980) Dynamic–Behaviour Theory (DBT), which identified similar properties (biopsychosocial influences) and, in particular, emphasised negative developmental experiences. Fineman (1980) proposed deliberate firesetting was the result of psychosocial influences in the firesetter's past which prompts them to set deliberate fires. The DBT explains the firesetting behaviour

as a social learning experience such that firesetters have historical experiences that make antisocial behaviour more likely. Fineman (1980) further suggests that previous and current environmental factors in the deliberate firesetters life, reinforce antisocial and firesetting tendencies. The DBT proposes that this, along with the immediate positive experiences of firesetting, such as enjoyable sensory input, trigger firesetters to set deliberate fires (Fineman, 1980). Fineman's (1980) DBT relies upon positive reinforces, both internal and external, occurring for the firesetter for them to continue to set deliberate fires. The DBT does not appear, however, to take into account mental health or gender differences of firesetters (Gannon, 2016). The DBT does not include explanations for how or why a particular target of firesetting is chosen. As with the single-factor theories, it also focuses on the findings from apprehended firesetters, limiting the findings to those who are subject to research due to incarceration or detention.

Jackson, Glass, and Hope (1987) also proposed a multi–factor theory of firesetting, Functional Analysis Theory (FAT), that attempted to explain deliberate firesetting through looking at 'Antecedent events', 'Behaviours' and 'Consequences'. The antecedent events were attributed to five underlying triggering factors. These five factors were identified as: psychosocial disadvantage, dissatisfaction with life and the self, ineffective social interaction, specific psychosocial stimuli and triggering stimuli (Jackson, et al., 1987). The behaviours following from these antecedents were identified as including all behaviours that were likely to occur immediately before, during and immediately after the deliberate firesetting. Thus, for example, remaining at the crime scene was considered as part of the firesetting behaviour. The consequences were seen as being separated into two developmental stages, 'normal childhood fireplay' and 'later pathological firesetting' (Jackson, et al., 1987). During the consequences stage, Jackson, et al., (1987) identified that both positive and negative

reinforcement of deliberate firesetting could occur. This theory has been criticised for not including elements such as mental health problems or the role that gender may play in firesetting (Gannon, 2016). As with the DBT, the FAT also does not include explanations for potential differences in the types of targets that may be set fire to nor how the firesetter may choose targets. Additionally, the theory is based on the findings from research with apprehended firesetters.

Finally, the Multi–Trajectory Theory of Adult Firesetting (M–TTAF) developed by Gannon, Ó Ciardha, Doley, and Alleyne (2012) offers the most comprehensive understanding of firesetting to date. The M–TTAF incorporates the strengths of previous multi–factorial explanations and more recent research on firesetters. It is comprised of two tiers; tier one outlines the broad theoretical framework for firesetting and tier two outlines its hypothesis of different typologies based on motivation and emotional responses. The theoretical framework, tier one (see figure 1), includes psychological, developmental, social, cultural and biological factors that are all critical influences on an individual developing into a firesetter (Doley et al., 2016). It is comprised of three inter–related concepts that seek to demonstrate the different components of an individual's journey towards firesetting behaviours.

According to the M-TAFF, the three inter-related concepts in tier one are: establishing a concept of "developmental context" (p. 19), which contributes to the second concept of "psychological vulnerabilities" (p.19), which in turn form the third concept of "critical risk factors" (p.21) leading to firesetting behaviour (Gannon, 2016). Additionally, the model identifies "proximal factors and triggers" as well as "moderators" which both feed into the "psychological vulnerabilities" (Gannon, 2016, p. 21). Within each of the three main concepts, Gannon, et al. (2012) have detailed the factors that make up each element. For example, within an individual's developmental

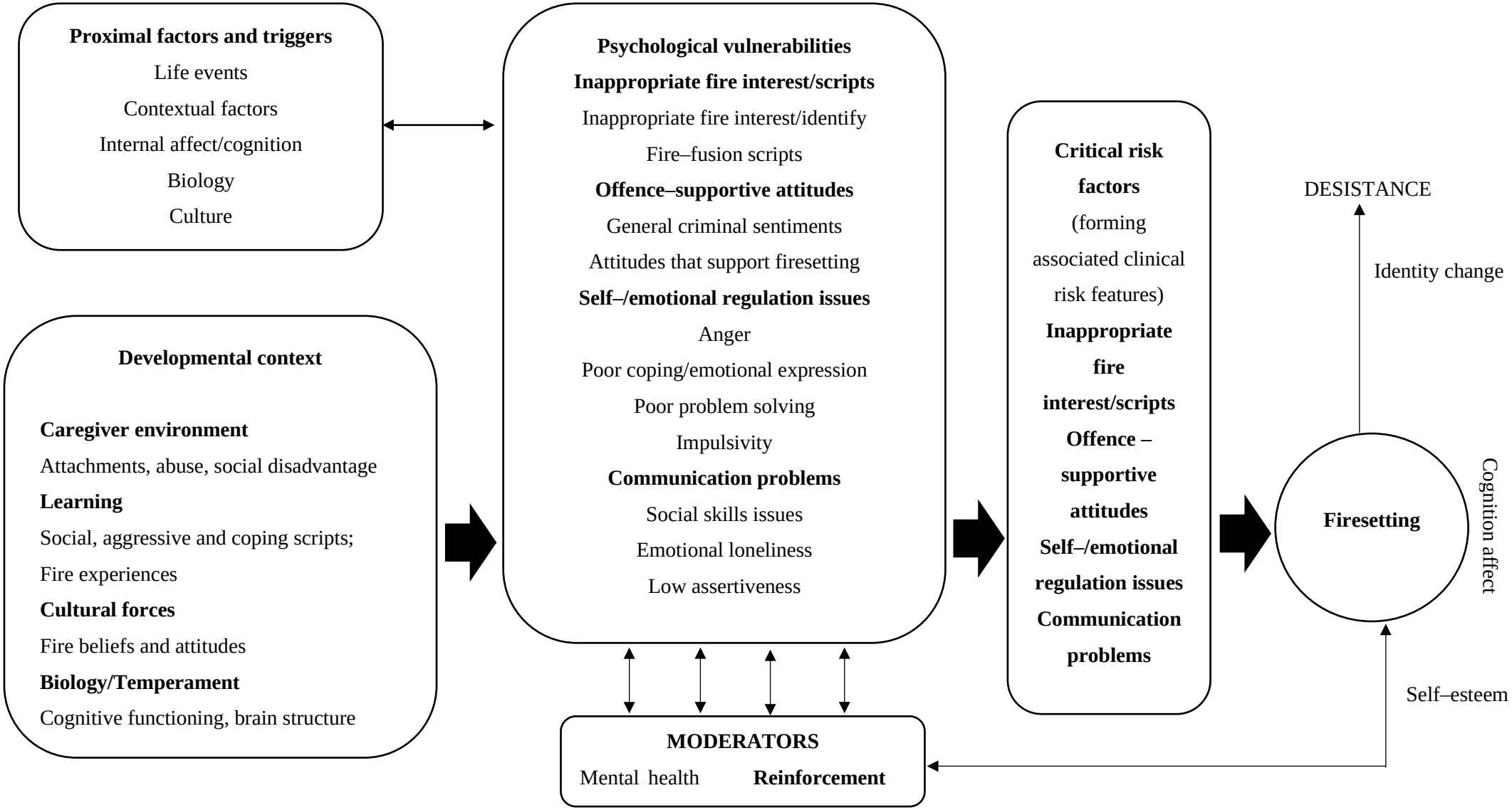

Figure 1. M–TAFF theory of firesetting: tier 1

context, contributory factors such as attachment, social interactions and experiences, brain functioning as well as their thoughts and feelings regarding fire are detailed. Gannon et al. (2012) consider the psychological vulnerabilities of an individual to be communication issues, poor coping and self–regulation, as well as positive attitudes towards firesetting. Proximal factors and triggers include life events, biology with contextual factors and moderators being the individual's mental health and the reinforcement of the individual's firesetting behaviour through positive firesetting experiences (Gannon et al., 2012). Gannon et al. (2012) state that critical risk factors also contribute, including: inappropriate fire interest, offence supportive attitudes, self–regulation issues, and communication difficulties. This theory has wide empirical support (Canter & Fritzon, 1998; Doley 2003a; Jackson, et al.,1987; Räsänen, Hirvenoja, Hakko, & Väisänen, 1995; Räsänen, Puumalainen, Janhonen, & Väisänen, 1996; Rice & Harris, 1991). In short, multi–factorial theories (particularly the M–TAFF) go a long way to aid our understanding and identify the complex elements and interactions which combine to trigger firesetting behaviour.

Characteristics of firesetters

The theories identified above are empirically supported by established characteristics of apprehended firesetters. For example, it has been demonstrated that poor social skills, being socially isolated and lack of assertiveness are consistently identified as likely to occur in those who deliberately set fires (Burton, McNiel, & Binder, 2012; Canter & Almond, 2002; Fritzon, Lewis, & Doley, 2011; Gannon & Pina, 2010; Rice & Harris, 1991). It is also widely acknowledged that during childhood and adolescence there is an almost universal interest in firesetting (Jackson, et al., 1987; Kocsis, 2002; Lambie, Ioane, & Randell, 2016; Tiffin & Cooper, 2006). This also lends weight to the consistently reported assertion that apprehended firesetters tend to be

young and male (Burton, McNiel, & Binder, 2012; Canter & Almond, 2002; Canter & Fritzon, 1998; Gannon & Pina, 2010; Lambie & Randell, 2011; Lowenstein, 2003; Tiffin & Cooper, 2006). Burton, McNiel and Binder (2012) completed a comprehensive review of the literature and reported that apprehended firesetters are also often unmarried, poorly educated and unskilled.

Identification of mental health and personality disorder traits have also been researched extensively in apprehended firesetters (Tyler & Gannon, 2012). Lambie and Randell (2012) and Stockburger and Omar (2014) found higher rates of depression, conduct disorder, along with anxiety and depression. Kocsis (2002) and Stockburger and Omar (2014) identified a prevalence for schizophrenia, antisocial personality disorder and histrionic personality disorder along with depression and bi–polar disorder.

The characteristics identified, tend to be consistent in the literature and are generally supportive of the development of theories to explain firesetting, however, they are based upon firesetters who have been apprehended. Due to low detection rates for deliberate firesetting, it is likely that these firesetters are not representative of all firesetters. They represent those who have apprehended and whose case files are available for assessment or who consented to take part in interviews and/or assessments for their firesetting behaviour. Therefore, conclusions regarding firesetters are currently based upon apprehended firesetters, which may be inaccurate or biased. This has implications for theories explaining firesetting. Of interest is that *both* apprehended and un–apprehended firesetters display crime scene behaviours that could be analysed; discussed next.

The importance of crime scene behaviours

Further understanding and profiling of deliberate firesetters can be developed through their offending behaviour (Canter & Fritzon, 1998; Davis & Bennett, 2016). A conceptual model has been developed to facilitate understanding of the profiling of an offender and the value of crime scene behaviours (Davis & Bennett, 2016). Davis's model put forward in 2005 (cited in Davis & Bennett, 2016), theorises that to understand what influences offending behaviour, both personality and situational influences need to be considered. Davis reports that since the demographics of an offender have a direct impact on their personality, it is the personality of the offender, along with the situational influences, which have greatest influence on offending behaviour. Therefore, it is possible that better comprehension of offending behaviour can also facilitate understanding of offender personality.

It is recognised that situational influences (victim impact) are reduced in firesetting, when compared to offences such as rape (Davis & Bennett, 2016). This is because there is no victim to influence the choices of the offender in firesetting, thus the interaction between victim and perpetrator that occurs within other offences (such as rape), does not occur within firesetting. Therefore, the bearing of situational influences (victim impact) on the offence behaviour of a firesetter is likely to be minimal. Davis and Bennett (2016) state that there is more value in studying crime scene behaviours in firesetting (compared to other offences), because of their greater ability to predict the offender's characteristics. Thus, it follows, that developing greater understanding of crime scene behaviour of firesetters can support links between these behaviours and the personality traits of the firesetter. Developing this understanding of crime scene behaviours to inform better understanding of firesetter personality and characteristics will aid detection, risk assessment and interventions.

Difficulties in studying firesetting

In sum, the findings reported above are based upon those firesetters who are apprehended, which is a limited sub–group of firesetters (Gannon, 2016; Rider, 1980). Often research and reviews of literature are focused upon firesetters who are subject to a psychiatric assessment and/or detainment, have learning difficulties or are very young (Burton, McNiel, & Binder, 2012; Lees–Warley & Rose 2015; Tyler & Gannon, 2012). It is suggested that research focused on participants who are selected only from apprehended firesetters and/or from a sub–group of firesetters, means that those identified for analysis are likely to be a biased representation of all firesetters. Thus, demographic information, personality traits and crime scene behaviours identified in the existing research may also be biased. Mixed reporting across studies regarding mental health problems and personality disorders suggest that conclusions regarding personality traits, mental health issues and upbringing may be questionable (Gannon & Pina, 2010; Kocsis, 2002).

Aims of this thesis

The thesis will address the following aims:

1. **Develop a comprehensive overview of current, relevant, empirically-based firesetter types.**
2. **Explore the value of utilising crime scene behaviours in developing understanding of firesetters**.
3. **Contribute to our understanding of both apprehended and un–apprehended firesetter types through analysis of their crime scene behaviours.**

In achieving these aims, this thesis attempts to tackle three areas that are problematic within research aimed at identifying a typology of firesetters. Firstly, it attempts to address the lack of consistency between firesetting typologies. It addresses issues regarding the kinds of variables used to develop firesetter types and typologies and looks at how resolve the inherent difficulties in comparing firesetter types subjectively (addressed in detail in Chapters 2 and 3). Previous research has attempted to create typologies for specific sub–groups of firesetters, such as mentally disordered or child/juvenile firesetters. However, this has not allowed for an all–encompassing firesetter typology. Secondly, this thesis attempts to address the lack of understanding and research into un–apprehended firesetters who are likely to contribute to a large number of undetected deliberate fires being set in England each year. Previous research may have neglected this group of firesetters due to the inherent difficulties in accessing this population for inclusion in research. It is hoped that this thesis will provide a basis from which future studies will continue to explore both apprehended and un–apprehended firesetters.

Overview of thesis

The Systematic Literature Review (SLR) in Chapter two, examines the typologies of firesetters proposed in published research and dissertations, providing a basis from which to develop an overview of current understanding of firesetter types. It does this through identifying six studies, each suggesting a different firesetter typology, which are based upon a range of populations of apprehended firesetters and which have between three and six types of firesetters in each typology. The findings of Chapter two informs understanding of the extent to which un–apprehended firesetters are included in firesetting research and how well current typologies address this issue. An examination of the studies discussed highlights the difficulties inherent in selecting a sub–group of

population to research. Chapter two indicates the value of including both apprehended and un–apprehended firesetters in research. The SLR also considers the variables (i.e., personal characteristics, crime scene behaviours, socio–economic background etc.) used for the development of deliberate firesetter types and the ways in which using consistent and objective variables, most notably crime scene behaviours, may enable more objective comparison between firesetter types. Reviewing typologies will allow for the identification of the most consistent and robust firesetter types in current literature.

The research project, in Chapter three, identifies firesetting crime scene behaviour variables of both apprehended and un–apprehended firesetters. The most empirically sound and comprehensive source for this data is the Fire and Rescue Service (FRS) who record data on all deliberately set fires attended, whether they result in a conviction or not. The research utilises the most appropriate variables available, identified in Chapter two, to conduct analysis identifying firesetter types, including both apprehended and un–apprehended firesetters, proposing a new typology. The three firesetting types established using Multi–Dimensional Scaling[1] (MDS) analysis are explored and compared to the most empirically based and replicable typologies identified in Chapter two. The value of this new typology is considered, along with the possible impact for future work in identifying those likely to have set fires deliberately. It is believed to be the first time both apprehended and un–apprehended firesetting populations have been analysed together to develop a firesetter typology. It is also believed to be the first time research has attempted to identify firesetters based on their firesetting crime scene behaviours. The findings of this research will help support the development of a list of those variables most likely to provide comprehensive and relevant representation of firesetter types. The list of variables identified can also

[1] MDS is a form of factor analysis where variable frequencies and interactions are represented visually on a scatterplot.

indicate whether firesetting crime scene behaviour variables are consistent enough, within a firesetter type, to be considered for investigative purposes.

Chapter four is a critique of the Fire Proclivities Scale (FPS), which is an assessment developed to identify un–apprehended firesetters from the general population through their propensity to set fires (Gannon & Barrowcliffe, 2012). The critique first examines the current firesetting assessments and what they add to our ability to detect, provide interventions for and manage risk of firesetters. The FPS uses firesetting scenarios and a Likert scale along with self–report of psycho–social factors to determine differences between un–apprehended firesetters and non–firesetters in the general population. The critique also examines the validity and empirical basis of the FPS, as well as considering the outcomes of published papers reporting its use. This will demonstrate whether underlying traits and behaviours identified by the FPS as relevant to distinguish between un–apprehended firesetters and the general population are valid. The critique will, in this way, contribute to an improved understanding of un–apprehended firesetters traits and firesetting behaviours. The critique of the FPS will also indicate relevant focus for future research on understanding un–apprehended detected firesetters. Chapter four concludes that the FPS shows promise and would benefit from further use and analysis to demonstrate validity and relevance.

Therefore, the thesis will develop our understanding of apprehended and un–apprehended firesetters' crime scene behaviours and their relationship with, as well as a comprehensive overview of, apprehended and un–apprehended deliberate firesetter types.

Chapter 2

Typologies of Deliberate Firesetters: A Systematic Literature Review

Abstract

This Systematic Literature Review (SLR) looks at the relevance of research into firesetting typologies and behaviours. It presents early attempts to understand firesetting behaviour through reviewing and comparing the research that defines firesetters into categories; addressing motivations, behaviours and personality. The bias and difficulties of previous literature reviews are also highlighted and discussed. The aims of the SLR are: to identify different types of firesetters; draw together the different typologies proposed in the literature whilst considering their strengths and weaknesses; examine the variables used to determine typologies; and provide insight into fruitful areas of research in the future. The studies included in this review were identified through systematic searches of 4 well–recognised databases (PsycINFO, PsycARTICLES, PubMed, Web of Science). Six studies were identified as meeting the inclusion criteria, all of which were subjected to quality analysis and data extraction. Emphasis is placed on the number and description of firesetter types in each typology as well as number and categories of variables used, outlined in each paper. Problems with comparing different typologies are identified, including methodological differences between the studies and the lack of flexibility in defining individuals into distinct typologies. Areas of future research to develop a wider understanding of typologies is suggested, including the use of appropriate and relevant variables as well as the value of being theory driven.

Background

Relevance

As discussed in Chapter one, firesetting has been a central element of human evolution and development, inherent in ensuring our most basic needs are met (Prins, 1994). Chapter one also highlighted the devastation and range of consequences fires can have to individuals, communities and society. The lack of research into firesetting and the limited nature of our understanding of firesetters was explored (Doley, 2003; Tyler & Gannon, 2012) as well as the value of developing a typology to organise and structure our understanding of firesetters. Within the development of typologies, it seems that researchers utilise a number of different variables across their research. Examining this systematically will support better understanding of the literature on which current firesetter typologies are based. Thus, an essential part of furthering our knowledge of firesetters lies in identifying and reviewing the existing research on firesetting typologies, identifying those that have a strong evidence base from which conclusions can be drawn and clarifying future research needs.

Context

Firesetting is woefully under–researched and there are few validated and commonly utilised firesetter types to support comprehensive understanding of firesetters (Gannon & Pina, 2010; Lambie & Randell, 2011; Lees–Warley & Rose 2015; Prins, 1994; Tyler & Gannon, 2012). Categorising and organising firesetters and their crime scene behaviours allows for better understanding of the firesetters which can inform interventions, treatment and risk management. Due to range of definitions and ways in which words such as firesetting, arson and pyromania are used and interpreted, there can be confusion and difficulty in identifying the differences and similarities within firesetting research. Continued lack of clarity can cause challenges in ongoing research,

for example, a firesetting behaviour within one research study may not be included in another leading to confusion and difficulties in replicability. Therefore, being clear and precise regarding terms and language is a useful start to exploring the topic further.

As discussed in Chapter one, terms are used interchangeably, making identifying similarities and differences between those who deliberately set fires challenging. This difficulty highlights a need for greater clarity within research on deliberate firesetting. As in the previous Chapter, this review will use the term 'firesetter' when referring to sample populations identified for firesetting research, whether or not they have been accused or convicted of arson and whether or not they have been given a diagnosis of pyromania.

Previous Literature Reviews

When considering the relevance and value of conducting this SLR it was important to consider existing reviews. A search of Cochrane Library, Campbell Library and Birmingham Library, identified seven literature reviews dating from 1981 through to 2015. Lees–Warley and Rose (2014) conducted a review looking at studies on firesetting adults with low IQ. This review considered interventions, assessment and treatment of firesetters with a low IQ. There were two reviews looking exclusively at children and adolescent firesetters (Kennedy, Vale, Khan, & McAnaney, 2006; Lambie & Randell, 2011). These reviews reported on typologies, risk assessment and treatment; with Kennedy et al. (2016) focused on recidivism and risk. Tyler and Gannon (2012) reviewed studies on firesetters who were mentally disordered and looked at all elements of mentally disordered firesetting offenders, in particular risk, recidivism and treatment. One, unpublished, review identified research studies looking at recidivism and focused on adult firesetters within the prison and probation system (Field, 2016). Gannon and

Pina (2010) identified research which considered adult firesetters, including their aetiology, characteristics, risk factors etc. Finally, the seventh review was the oldest and looked at firesetters, considering their typology (Blumberg, 1981). This considered all types of firesetters and looked exclusively at studies which considered the typologies of firesetters.

On considering these existing reviews, it was deemed that the current SLR was necessary. Six of the existing reviews were looking at a very specific sub–section of firesetters, for instance those with low IQ, or only those within a certain age bracket. Some of the reviews focus on risk and/or treatment, rather than typologies. Blumberg (1981) was the only review identified which considered all types of firesetter and was concerned purely with typologies. However, this review is over 30 years old and therefore misses a great deal of more recent research. Moreover, some of the reviews, in particular Blumberg (1981) and Gannon and Pina (2010) were not systematic and therefore it is not clear how broad a scope of studies and papers were considered for inclusion, or how bias towards selecting certain studies may have contributed towards the conclusions of the review.

Aims and Objectives

The literature reviews identified above, although contributing to our understanding of firesetting in a variety of ways, do not comprehensively cover recent studies analysing and delineating typologies of all firesetters. It is important to examine the evidence base for discriminating between firesetters and therefore there is a need for an up to date SLR of studies focusing on all types of firesetters' typologies. A comprehensive review contributes to our knowledge and understanding of all firesetter typologies, not just children and adolescents or firesetters linked to the criminal justice

service. As a poorly researched area, reviewing current research in firesetting with respect to identifying a verifiable and evidence–based typology of firesetters can support the development of understanding firesetting. Research such as this can inform our capacity to identify, assess, treat and manage the risk of firesetters. This SLR is concerned with identifying and reviewing studies which have focused on developing and supporting our understanding of firesetters typologies. The review comprehensively covers all firesetters, regardless of age, gender, nationality, IQ, connection to the criminal justice service or mental health diagnosis.

Therefore, the aim of this SLR is to identify typologies of firesetters in order to further develop our understanding of firesetters. The objectives are:

- To identify different types of firesetters, encompassing a full range of genders, ages, nationalities, mental health diagnoses or connections, if any, with the criminal justice system.
- To highlight and draw together the different typologies identified and consider their strengths, weaknesses, where they overlap and where they differ.
- To identify the number, nature of and validity of different variables used by studies in determining a typology.
- To provide insight into areas useful to future research.

Method

Sources of Literature

To identify research for quality assessment and possible inclusion in this review the following databases were searched on 18th May 2017; PsycARTICLES, PsycINFO, PubMed and Web of Science. Searches were also conducted for dissertations and both

the Dissertation and Theses Global (ProQuest) and the University of Birmingham Dissertation search engines were used. To support a reduction in possible publishing bias, a search was conducted using the Google search engine to cover conference presentations and other possible sources of research. Additionally, the references of relevant articles identified through initial searches were also considered. All research reviewed was published from 1992 up until the third week in May 2017. This was to allow for the consideration of the most relevant and contemporary research theories in understanding arson and firesetting that have been published within the last 25 years. Although some seminal research was conducted before this time, for example Lewis and Yarnell in 1951 and Inciardi in 1970, it was decided to focus on more recent studies as these studies are now over 49 years old. Changes in definitions of arson and firesetting, as well as the development of our understanding, have greatly advanced within the last two decades, rendering research on typology and classification of firesetting and arson prior to this, less relevant. Three key researchers (Katrina Fritzon, Theresa Gannon and Ciaolite Ó Ciardha) were contacted via email to identify any other appropriate, but as yet unpublished, research or dissertations. Replies from all three researchers stated there were no studies they had access to that were relevant for this SLR (see appendix 1 for a copy of the email sent out). All searches were repeated in the third week of May 2019; however, no additional relevant articles were found.

Search Strategy

The databases identified above were searched using the search terms and their synonyms identified in Table 1. To capture as full a range of typologies and categories, it was decided not to further limit the research by firesetters' age, gender or mental health status. Each string of synonyms was searched for individually before combining them; this was repeated for each database. All searches looked for the synonyms in the

abstract only, where possible. It was considered that research where the search terms appeared in the abstract would be relevant. This is because most research on firesetting includes a description of at least one theory of categorisation or typology in the introduction. Widening the search to include the whole article would have run the risk of including almost all studies on arson and firesetting.

Table 1

Key search words and the synonyms used

Arson	Deliberate	Categories
Arson*	Deliberat*	Categ*
Firesett*	Intention*	Group*
Fireplay*		Link*
Pyrom*		Sort*
		Classif*
		Typol*

Table 1

Study selection

Inclusion criteria and PICOS[1]

After the initial search was conducted, an initial screening process was completed where duplicate papers and papers on topics that were clearly unrelated were removed. The resulting research papers' abstracts were then compared to the inclusion and exclusion criteria (Table 2) and those not meeting these requirements were removed. Figure 2 demonstrates the selection process (see appendix 2 for reference list of all 162 articles identified in the search, once all the duplicates had been removed).

[1] PICOS stands for **P**roblem, **I**ntervention, **C**omparison, **O**utcome and **S**tudy type and is a framework used when developing literature search strategy in systematic reviews.

Table 2

Exclusion and Inclusion criteria within the PICOS framework

Topic	Inclusion Criteria	Exclusion Criteria
Population	Anyone deliberately firesetting, irrespective of whether convicted of arson. Any age, gender, nationality and ethnicity. Any mental health or personality disorder.	Study does not include those setting deliberate fires. Study's focus is on participants whose primary conviction/offence is for another offence type.
Intervention and Comparator	Typologies or Categorisation of deliberate firesetters. Environmental and crime scene factors and behaviours.	Focus on psychological, background/historical predisposition and/or related descriptors. Focus on evaluation of interventions or assessments including risk related. Focus on only one sub–category of firesetter type.
Outcome	Proposal of a typology or categorisation of deliberate firesetters.	Description of characteristics or psychosocial factors predisposing firesetting.
Study Type	Cross–sectional. Retrospective.	Commentaries, Editorials, Reviews, Discussion and Case studies. Inferential Typology or Categories.
Other criteria	English language. Year of publication, 1992–2017.	

Table 2

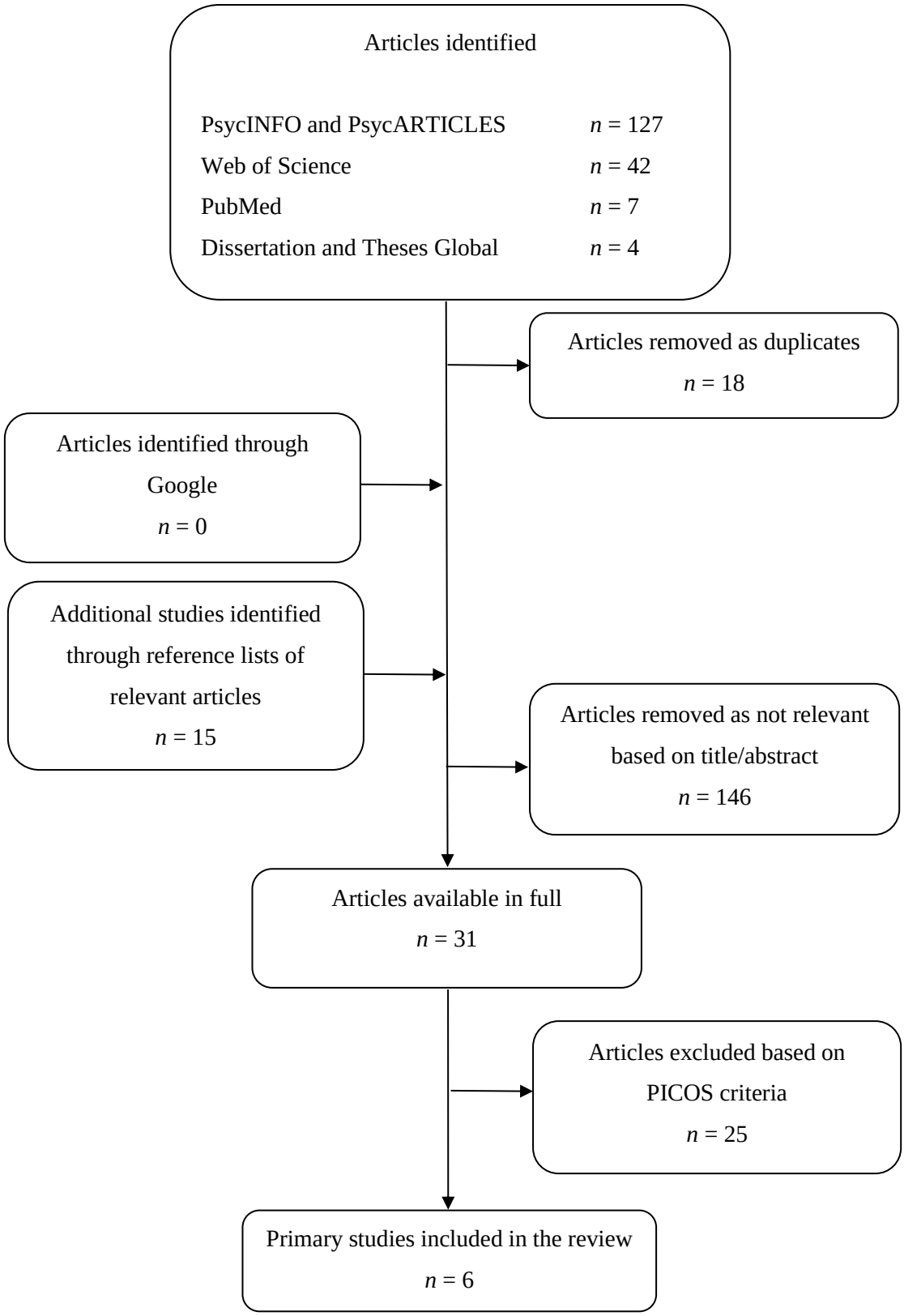

Figure 2. Flowchart of article selection and exclusion.

Quality assessment

After the PICOS criteria were applied, the remaining six studies were assessed for quality. The quality assessment tool was developed for this study, by adapting three freely available quality assessment tools: Criteria for the Evaluation of Qualitative Research Papers (2013), Critical Appraisal Skills Programme (CASP) checklist for qualitative studies (2006) and NICE Checklist for qualitative studies (2012).

Individually, none of the quality assessment tools identified were able to address the specific questions and items of quality assessment relevant for the studies being considered. Therefore, amalgamating the appropriate elements from each quality assessment tool allowed for the selection of the most relevant and applicable parts of each of the assessment questionnaires. The quality assessment tool had 14 items, covering criteria such as theoretical approach, study design, data collection, trustworthiness, analysis and ethics (Table 3, see also appendix 3).

Each of the 14 items were assessed qualitatively and an overall judgment was made for each research paper with a rating of '–' (poor), '+' (acceptable) or '++' (good). These overall judgements were arrived at after initially rating each of the 14 items descriptively and then interpreting these as '–' , '+' or '++'. The overall conclusion was based upon summing the '–' , '+' or '++' for all 14 items, with the highest scoring of these providing the overall rating result. To support objectivity and to ensure consistency, 2 studies were also rated by a Clinical Psychologist with no bias or affiliations. After being considered independently, the ratings were compared and after discussion all fourteen points for each paper were agreed upon. The final quality assessment scores are displayed in Table 4.

Table 3 *Items, framed as questions, in the quality assessment tool*
1. Is the study clear in what it seeks to do, its aims?
2. How defensible/rigorous is the research design/methodology?
3. Is the selection of cases or participants theoretically justified?
4. How well was the data collection carried out?
5. Was the data collected reliable and did it address the research issue?
6. Is the role of the researcher clearly described?
7. Is the context clearly described?
8. Is the data analysis sufficiently rigorous?
9. Is the data 'rich'?
10. Is the analysis reliable?
11. Are the findings convincing?
12. Are the findings relevant to the aims of the study?
13. Are the conclusions sound?
14. How clear and coherent is the reporting of ethics?

Table 3

Data extraction

To address the Systematic Literature Review questions, relevant data was extracted from a balanced search of papers using a data extraction form developed for this review (see appendix 4). Relevant data extracted included the number of variables used in each study, a list of the variables used in that particular study and a description of the typology developed for comparison. Variables are especially important to focus on as they represent the behaviours and traits researchers deemed relevant to understanding firesetting typologies. The variables were, therefore, instrumental in aiding the researchers to sort and identify their different firesetter types.

Results

A summary of the data extracted is displayed in Table 4. Table 4 demonstrates the comparisons made between the studies through considering the way in which each study approached the task of developing types of firesetters, the empirical basis of the typology, as well as the validity of the conclusions and types identified. Some consideration is given to issues regarding bias, and limitations to generalisability of the typologies. First, each paper will be briefly described and, following this, the data will be synthesised descriptively to consider the variables and populations selected for study and the impact of this upon the biases and limitations.

Descriptive Data Synthesis

All six studies identified between three and six types to represent the group or sub–group of firesetting participants. There were three main samples of firesetters included in this review: (a) three papers analysed firesetters who had been identified by the Police or Fire Services and interviewed as part of an investigative process (Canter & Fritzon, 1998; Icove & Estepp, 1987; Kocsis & Cooksey, 2002); (b) two papers considered the typologies of mentally disordered firesetters admitted to a mental health institution (Green et al., 2014; Harris & Rice, 1996), and (c) one study reviewed firesetting children, aged 4–11 years, who had been referred by a number of different agencies (Del Bove, 2005). The findings for each of these samples of firesetters will next be discussed in turn.

Canter and Fritzon (1998)

The study examined 142 firesetters convicted of firesetting, using data extracted from Police interviews. Canter and Fritzon (1998) utilised 64 variables to identify different types of firesetters. The variables used were focused on the offence or offender. The

Table 4

Summary of the data extracted from the six articles included in the review

Authors, source and year	Offender group and number	Time frame	Data source and number of variables	Number of typologies and names	Bias and limitations to generalisability	Quality Assess-ment Outcome
Canter, D. and Fritzon, K. Journal 1998	142 firesetters No age range stated (12 – 60 years old mentioned in one typology)	Not stated	Police files 64	Four 1. Expressive Person 2. Instrumental Person 3. Expressive Object 4. Instrumental Object	• Pre–identified typologies, possible bias in ensuring results confirmed typologies. • Variables extracted from Police files, bias in Police Officers' reporting. • Relies on offender's self-report or Police Officers' comments to identify motive. • Conducted in England.	+
Del Bove, G. Dissertation 2005	240 Juvenile firesetters 4–17 years old	7 ½ years 1996 – 2003	Question-naires (children and parents or carers) 53	Three 1. Conventional Limited (38%) 2. Home Instability–Moderate (37%) 3. Multi–Risk Persistent (25%)	• Only juveniles referred to the intervention service. • Wide definition of firesetting. • Younger respondents would not have been able to complete the form themselves and dependent on parents'/carers' reporting. • Conducted in Canada.	+

Authors, location and year	Offender group and number	Time frame	Data source and number of variables	Number of typologies and names	Bias and limitations to generalisability	Quality Assess-ment Outcome
Green, B., Lowry, T., Pathé, M. and McVie, N. Journal 2014	59 Mentally disordered adults No age range given	10 years 2002 – 2012	Mental Health case notes/files? 46	Three 1. Angry/Antisocial 2. Spree 3. Persecuted/Suicidal This group could have been further divided into two sub–groups based on mental health	• Possible innocence of charge of arson due to never standing trial because of poor mental health. • There may have been individual cases where the firesetter was mentally unwell at the time of firesetting or at other times but as they were able to stand trial they would not have been included in the study. • Conducted in Australia.	++
Harris, G. and Rice, M. Journal 1996	243 Mentally disordered adults No age range given	10 years 1973 – 1983	Mental Health files 11	Four (or five) 1. Psychotics (33%) 2. Unassertives (28%) 3. Multi–firesetters (23%) This group could have been further divided to two sub–groups, these are not named. 4. Criminals (16%)	• Included those accused of arson without being charged. • Only includes those who are in maximum security and therefore does not include those from medium or low secure. • Discrepancy between reported number of variables (initially 40) and numbers of those listed in various tables (48). • Conducted in Canada.	+

Authors, location and year	Offender group and number	Time frame	Data source and number of variables	Number of typologies and names	Bias and limitations to generalisability	Quality Assess-ment Outcome
Icove, D. and Estepp, M. FBI Bulletin 1987	1,016 firesetters charged with arson or arson related offence No age provided, although 'juveniles' identified	8 years 1977–1985	Fire Department interviews 22	Six 1. Vandalism (49%) 2. Excitement (25%) 3. Revenge (14%) 4. Other (8%) 5. Crime concealment (2%) 6. Profit (1%)	• Considers only those charged with firesetting or 'related' offences. • Interviews were conducted by fire or police officers influencing the firesetters' openness. • There is a typology called 'other', however no details or description is given for this typology nor why they have not detailed it Possibly the researchers utilised this for those that do not fit the other typologies. • Conducted in America.	–
Kocsis, R. and Cooksey, R. Journal 2002	148 firesetters convicted of at least three arson offences No age range given	18 years 1980–1998	Police interviews 71	Five 1. Common 2. Thrill 3. Anger 4. Wanton 5. Sexual	• Considers only those convicted of three or more arson offences (serial firesetters). • Very long time period, encapsulating a wide range of repeat firesetters. • Data taken from interviews that were conducted by police officers for conviction purposes, likely to influence firesetters' openness. • Inclusion of some variables, e.g. hair and eye colour, that have questionable relevancy. • Conducted in Australia.	+

Table 4

variables included: specific fire behaviour, individual and environmental traits, demographic information, mental health issues, previous offending and firesetting recidivism information. They hypothesised, based on an underlying theory of firesetting being an expression of anger, that four firesetter types would be represented on their Smallest Space Analysis (SSA), an appropriate analysis for the research. SSA is a non–metric visually represented alternative to factor analysis, which identifies the underlying relationships between the data points and is a form of cluster analysis. The similarity of SSA to the analysis used in other studies (e.g., Green, Lowry, Pathé, & McVie, 2014; Kocsis & Cooksey, 2002;) ensures the results can be easily compared across studies, in respect to having readily analogous outputs. This study was also unusual in that, after identifying the firesetter types, the researchers considered which personality characteristics best fitted with each type, conducting statistical analysis to find correlations.

Canter and Fritzon (1998) analysed their data and found their results were consistent with this. Their hypothesising was clear and plausible set in well–founded theories and previous research, however, the way in which they interpreted the four types lends itself to some possible bias. Bias could have been introduced because anticipating that only four types would be identified, might have meant that only four types were looked for. It is also possible that, by attributing a pre–identified motivation of firesetting as an expression of anger prior to delineating variables within firesetter types, bias was introduced, as certain variables may have been perceived as more or less likely to occur as part of a particular motivation. Finally, the assumption that only one type of motivation would be present and remain consistent throughout the firesetting may have also confounded the firesetter types found. Consistency and clarity in motivation is questionable because motivations can be complex and require the

firesetter to have insight or accurate extrapolation of motivation from file data by the researcher (Doley, 2003a).

The four types of firesetters that Canter and Fritzon (1998) put forward are based upon research suggesting aggression is either instrumental (serving a purpose) or expressive (emotional expression). However, with no clear indication of the emotional state of the offenders or expressed motivation at the time of the offence, it would have been difficult to ascribe these distinctions to specific crime scene behaviours or other variables included in their SSA. Their four typologies were described as: 'Expressive Person', 'Instrumental Person', 'Expressive Object' and 'Instrumental Object'. Canter and Fritzon (1998) stated that 'Expressive' relates to the cause being from the person themselves and that they are expressing anger or other emotion. Canter and Fritzon (1998) stated that the other side of this was 'Instrumental' whereby the person set fires due to some instrumental gain or goal they are aiming for. The study also identified 'Person' versus 'Object', which related to whether the firesetter has any personal connection with what they set fire to (Person) or whether it is unrelated to them in a personal way (Object).

Canter and Fritzon (1998) did not provide an idea of what percentage of firesetters were represented by these different typologies. There was also very little detail regarding how they extracted and/or operationalised the variables and this makes replicating their method in other datasets very difficult. It is also troubling that the authors did not include any descriptive statistics about the firesetters' age, gender, employment status etc., which again makes it difficult to compare to samples and typologies identified in other research, where reporting this information is common. Other biases included the reliance on Police Officers' interview transcripts and the

questionable identification of firesetters as having a personality or mental health diagnosis. The diagnoses were based upon the opinion of the Police Officer interviewing the offender and commenting that the offender's behaviour was 'odd'.

In sum, the theory and concepts underlying this typology are sound, however, the way in which the researchers attempt to support their predictions through the data collection and analysis appears unsatisfactory. Little discussion is provided in terms of identifying possible flaws and biases or acknowledging the unusual method of identifying the typologies to be found before completing the analysis. In terms of quality, this study was rated a '+' for moderate.

Del Bove (2005)

This study identified 240 juvenile firesetters, aged between 4 and 17 years with a mean age of 11.1 years (*SD* = 3.04). There were 215 males and 25 females and were identified through an intervention programme, The Arson Prevention Programme for Children (TAPP–C) in Canada. Del Bove's (2005) research focuses on variables extracted from four questionnaires which were administered to both parents/carers and the firesetters themselves. The questionnaires were reported as being the Fire Involvement Interview, TAPP–C developmental history assessment, Fire Interest/Curiosity Questionnaire and Child Behaviour Checklist. There were no references provided for any of these assessments and no transcripts included in the paper. Del Bove (2005) reported the questionnaires covered a range of areas of the offender's lives and development, from which 53 variables were identified. The variables covered topic areas such as: specific fire behaviour, individual and environmental traits, demographic information, and firesetting recidivism. Del Bove (2005) used cluster analysis which identified three juvenile types: 'Conventional–

Limited' (38%[1]), 'Home Instability–Moderate' (37%[1]) and 'Multi–Risk Persistent' (25%[1]). The justification for the firesetter type labels is not clear. The labels may have been informed by particular variables used in the cluster analysis and therefore the extent to which the labels themselves add understanding to firesetter types is uncertain and may confuse or detract from the findings themselves. Del Bove (2005) identified a number of differences between these types, based on, for example, age, number of fires set, mental health issues, ability at school, social skills/behaviour, the extent to which they expressed remorse. Treatment and risk of recidivism were also considered, as well as ways in which these typologies may fit with typologies identified in previous research.

The aims of the study were clear and a very large sample was identified, with a number of varied and validated variables selected. The study was focused and contained a lot of detail regarding the characteristics of the firesetters, which facilitates replicability. However, there was no information included regarding a timeframe over which the participants were referred or selected for inclusion in the study. Biases may include the fact some of the firesetters were very young and may have not been able to fully understand what they were being asked or articulate themselves comprehensively. They were also interviewed as part of an intervention programme, suggesting they were deemed enough of a risk to require an intervention, possibly restricting the sample to a sub–group of more serious firesetting children. Additionally, as the parents/carers attended the interviews, the firesetters may have been affected by the presence of their parents/carers, as well as their experiences of attending an intervention programme. The firesetters may have been more likely to adjust their answers to more socially desirable ones, introducing potential bias to the data collection. Del Bove's (2005)

[1] % of population sampled

conclusions emphasised the importance the findings can have on risk, mental health and treatment needs. This study was rated a '+', meaning moderate.

Green, Lowry, Pathé and McVie (2014)

The study included 59 mentally disordered firesetters to support the identification of a sub–group of mentally disordered firesetter types. In this study, mental disorder pertained to the diagnosis of a mental health illness that was considered severe enough to result in the detention of an individual under the mental health laws of Australia. Green et al. (2014) reported the case details of mentally disordered firesetters, identifying 46 different variables which were analysed using cluster analysis to identify typologies. Based on the result of the cluster analysis, Green et al. (2014) put forward three typologies of mentally disordered firesetters: 'Angry/Antisocial', 'Spree' and 'Persecuted/Suicidal'. Variables were based on arson target, fire characteristics, diagnosis, symptoms and motives. Green et al. (2014) did not indicate the percentage representation of each of these typologies, nor to what extent they were representative of mentally disordered firesetters generally. There was heavy emphasis on mental health diagnosis for this typology, in keeping with the study's aim, which meant that a large proportion of variables used in this study were related to mental health. The study concludes with considering the treatment and risk implications of mentally disordered firesetters.

Green et al. (2014) was the only study included in this review which mentioned two researchers independently coding the variables. This highlights that effort was made to reduce bias where possible. Of note is that these firesetters had all been charged with arson, indicating congruence with the legal definition, however, there is no confirmation that they were guilty. Due to some of the variables including experiences

of firesetting behaviour, an assumption must be made that, whether or not they were convicted, they all had a history of firesetting. There were no other descriptive statistics provided about the demographics of the sample, making it difficult to identify to what ratio of adult/juvenile or male/female firesetters were included. This research would be difficult to replicate, as it was noted that 'suitable' firesetters were selected by staff, but there was no information on the selection criteria or process. The researchers also do not acknowledge other sampling issues, such as firesetters who may have been mentally disordered during their offence but were not identified as such by the Police and therefore not included in the research. Finally, only 59 firesetters were used for this study which calls into question the strength of the findings due to a limited number of firesetters for comparison. Having a smaller population from which to develop the typology could have increased the chances of a small number of unrepresentative firesetters having a greater impact on the analysis. The study concludes by highlighting the value of these typologies in providing focus for assessment and as well as possible areas for treatment. This study was rated '++' meaning a good level of quality.

Harris and Rice (1996)

The study included mentally disordered firesetters at a maximum security psychiatric institution. The researchers considered the files of 243 firesetters with a mental disorder diagnosis, identified over the course of 10 years. Participants included those charged or accused of arson under Canadian law, but who had not been convicted, however, the variables selected suggest firesetters had a history of firesetting. To explore mentally disordered firesetting typologies, the authors selected 48 variables, covering childhood and background information, current information of lifestyle, index fire information, and an assertiveness score. Harris and Rice (1996) identified four typologies with the caveat that one of the typologies could possibly be split into two.

The four types they reported were: 'Psychotics' (33%), 'Unassertives' (28%), 'Multi–firesetters' (23%) and 'Criminals' (16%). 'Multi–firesetters' were reported as possibly being divided to two sub–groups, however, these are not named or described and no further information was provided regarding this.

Harris and Rice (1996) used cluster analysis to analyse the variables to produce the four types but reported some difficulties. They stated that they ultimately focused on 11 variables which they believed were most evidence based and likely to represent different types of firesetters. One of the variables used was lack of assertiveness, based on Jackson, Glass, and Hope's (1987) theory of firesetting. However, there is no information presented to support the choice of other variables, how the decisions were made nor which other variables were selected, throwing into question the validity of the selected variables and the resultant types. Conclusions are drawn highlighting the importance of further research as well as considerations of risk and treatment. This study was rated '+' for moderate.

Icove and Estepp (1987)

This study included 1,016 firesetters charged with firesetting behaviour across an 8 year period, utilising only fire and police officer interview transcripts. The study included a manageable number of variables (22) that covered victimology, demographic, socioeconomic, alcohol/drug use and criminal history and behavioural traits. Chi–square was applied to identify types, the choice of which reflects the nature of the categorical variables used as well as the, possibly, restricted access or opportunity to conduct more complex statistical analysis. There were 6 types identified: 'Vandalism' (49%), 'Excitement' (25%), 'Revenge' (14%), 'Other' (8%), 'Crime concealment' (2%) and 'Profit' (1%). The study comprehensively discussed the 6 types

and described how they fitted into contemporary research of the time. It demonstrated the possible value in identifying a large number of firesetters to compare and it is of note that this study produced the largest number of types.

This paper included little in terms of reviewing previous research and no consideration seemed to be given to the possible bias of having police or fire officers interview firesetters. It is also important to acknowledge this study was published 30 years ago and it is possible that the relevancy of the outcome may have reduced in time. It is disappointing that although an 'Other' type is identified, there is no detail or description given to outline what characteristics this type has. Icove and Estepp (1987) conclude by highlighting the ways in which this research could be developed in the future through looking at the geography of the firesetters behaviour, as well as the interaction between urban areas, violent crime and firesetting. This study was rated '–' meaning poor.

Kocsis and Cooksey (2002)

This study was interested in serial firesetters and identifying types within this sub–group of firesetters. Kocsis and Cooksey (2002) defined a serial arsonist as someone with more than three arson convictions. They applied Multi–Dimensional Scaling (MDS) analysis on 71 variables and identified five types: 'Common', 'Thrill', 'Anger', 'Wanton' and 'Sexual'. The paper goes into great detail regarding the statistical analysis and description of these types. The variables cover personal offender characteristics, event–specific offender behaviour and choice, general offender behaviour variables, and crime scene identifiers.

This paper is very thorough and detailed in its analysis which can, at times, distract from the main points being made. There is little consideration given the implications of selecting data from Police interviews. This study has the greatest number of variables of all the papers included in this review, however, some of the variables are questionable in terms of the relevancy to firesetting behaviour and types. For example, variables such as hair colour and length, eye colour, facial hair, noticeable odour and accent are included, however, there is no discussion regarding in what way research supports the relevancy of these variables. Additionally, there is no information provided regarding how conclusions were drawn regarding potentially subjective variables, such as noticeable odour. Since there are no percentages or numbers of cases given for these typologies, it is particularly difficult to know to what extent each one is representative of serial firesetters. According to Kocsis and Cooksey (2002) the 'Sexual' type was based on "evidence the offender engaged in some sexual activity at the crime scene" (p. 653); however, there was no information provided as to how this conclusion was reached or what evidence was available to demonstrate this. This was the only variable linked to sexual behaviour within the type identified as sexual which raises questions regarding the validity of calling this type 'Sexual'. Good attempts are made throughout to link these typologies with those previously identified in research, particularly Canter and Fritzon's (1998) 'Expressive' versus 'Instrumental' and 'Object' versus 'People' firesetter types. Kocsis and Cooksey's (2002) study was given a rating of '+' for moderate.

Firesetters Identified by Police or Fire Services

The three studies which are most comparable in terms of population selection were those focusing on firesetters who had been identified by the Police or Fire Services. These studies included participants under 18 years old as well as adults,

although none identified a specific age range in their study. Of note is that Kocsis and Cooksey (2002) focused on firesetters who had been convicted of at least three fires and concentrated their attention on recidivism risk. It could be argued that these firesetters are a sub–group included in the populations sampled by Icove and Estepp (1987) and Canter and Fritzon (1998) who did not discriminate between one off and repeat firesetters when selecting participants. The studies were based in different countries, conducted in either America (Icove & Estepp, 1987), Australia (Kocsis & Cooksey, 2002) or England (Canter & Fritzon, 1998). It is important to bear this in mind when making direct comparisons between these studies, due to the subtle differences in the legal definition of arson and the impact this will have had on the selection of firesetters as participants. Additionally, Icove and Estepp's (1987) participants were arrested and charged but it was not specified whether they were convicted. Therefore, there may be a group of firesetters included in Icove and Estepp's (1987) study that would not have been included in the research by Canter and Fritzon (1998) and Kocsis and Cooksey (2002). Perhaps reflecting a greater range of firesetters, Icove and Estepp (1987) identified the greatest number of firesetter typologies (six). The three papers (Canter & Fritzon, 1998; Icove & Estepp, 1987; Kocsis & Cooksey, 2002) were also comparable with respect to the high number of cases of arson from which they drew out the variables they used, potentially resulting in more reliable identification of variables and, consequently, typologies. These three studies also had a high number of firesetter participation, ranging from 142 to 1,016 individual firesetters, compared to the average of 180 firesetters for the remaining three studies.

Cross–over between typologies can be identified; for instance Kocsis and Cooksey's (2002) 'Common' firesetters, Icove and Estepp's (1987) 'Vandalism' firesetters and Canter and Fritzon (1998) 'Instrumental Object' firesetters. These types

all share traits of individuals who entered a property and committed further crime/offences before setting a fire. All three studies state that this type of firesetter tends to be younger (juvenile), more likely to be with one or more other people, are more likely to remain at the fire scene and, as a result of this, are caught. There is also some overlap between Canter and Fritzon's (1998) 'Instrumental Person', Kocsis and Cooksey's (2002) 'Anger' firesetters and Icove and Estepp's (1987) 'Revenge' firesetters. Canter and Fritzon (1998) state that the 'Instrumental Person' firesetter is more likely to be motivated by revenge and is expressing their anger regarding conflict within, or the breakdown of, a relationship. This makes an explicit link with Icove and Estepp's (1987) 'Revenge' firesetters and Kocsis and Cooksey's (2002) 'Anger' firesetters' motivations. These firesetters all set fires that target a specific person due to previous issues, difficulties or altercations. Both Icove and Estepp (1987) and Kocsis and Cooksey (2002) report that their respective firesetter type does not stay or return to the scene of the firesetting. It could be argued that these three studies provide the most useful comparison for future research due to their wide ranging participants and inclusion of crime scene variables, as such, they are used for comparison in Chapter three.

Mentally Disordered Firesetters

There were two studies in this review that focused on mentally disordered firesetters (Green et al., 2014; Harris & Rice, 1996), however they had different definitions for identifying firesetters. Due to being conducted in different countries, it is possible cultural differences influence diagnosis of mental ill health as well as them having different laws relating to the detention of those with mental health problems. Green et al. (2014) conducted the research in Australia and, unusually, included the nationality of their participants who were 81.4% Australian born. Their participant

numbers were the lowest of all the studies covered in this SLR, (N = 59). In contrast to this, Harris and Rice (1996) identified 243 mental health patients who had set fires. However, both Harris and Rice (1996) and Green et al. (2014) did not require their firesetters to have been convicted, merely charged with a firesetting offence. These two studies had comparable number of variables, identifying 46 and 48 variables each, with a great number of cross–over in the variables selected. For instance, both studies considered details of the type of mental health diagnosis relevant, as well as symptoms. Both studies also included variables identifying motivation for the firesetting and some details about the firesetting incidence(s) itself. They also differed, with Green et al. (2014) being more focused on details relating to the mental health symptoms of the firesetters and very few variables on their personal background. Whereas Harris and Rice (1996) focused their variables more widely; including background information of the firesetter and the firesetters' mental health and criminal justice background and experiences.

In terms of quantity of types, both Green et al. (2014) and Harris and Rice (1996) identified a similar number of types, three and four respectively, and there appears to be some cross–over between the typologies they identified. However, any conclusions drawn will have to be cautious due to the limited description of the types offered by Green et al. (2014). Canter and Fritzon (1998) also identified two types that significantly correlated with having mental health problems. Although, Canter and Fritzon's (1998) identification of those with mental health problems was conducted through a Police case file and the interviewing officer's perception of the firesetters' behaviour as 'odd', therefore this link is questionable. Both Green et al. (2014) and Harris and Rice (1996) identified a typology focused on a sub–group of mentally disordered firesetters with greater criminal tendency. Green et al. (2014) called these

the 'Angry/Antisocial' firesetters and Harris and Rice (1996) identified them by the name 'Criminals'. These two types were similar and highlighted the extensive nature of their general offending.

Harris and Rice (1996), Green et al. (2014) and Canter and Fritzon (1998) all identified mentally disordered firesetters who regularly and frequently set fires. Harris and Rice (1996) called these types 'Multi–firesetters', Green et al. (2014) called them 'Spree' firesetters, and Canter and Fritzon (1998) labelled them as 'Expressive Object'. Canter and Fritzon's (1998) 'Expressive Object' and Harris and Rice's (1996) 'Multi–firesetters' types were also identified as likely to target hospitals. Interestingly, Green et al. (2014) stated they found no clear motive with 'Spree' firesetters; however Harris and Rice (1996) stated that 'Multi–firesetters' could be divided into two sub–groups which could suggest two different motivations within this type. This could help to explain why Green et al. (2014) were unable to find a clear motive for their 'Spree' firesetters. Green et al. (2014) also reported their typology 'Persecuted/Suicidal' could be further sub–divided based on the mental–health symptoms of depression and suicidal behaviour. Both Green et al. (2014) and Harris and Rice (1996) discuss the possibility of further division within their typologies. They highlight the difficulties of identifying firesetter typologies, to what extent further subdivision is useful as well as discussing what typologies add to our understanding of firesetters.

Juvenile firesetters

Del Bove's (2005) study examining juvenile firesetters was the predominant study on this cohort included in this review. Del Bove (2005) identified three different types of juvenile firesetters, 'Conventional–Limited', 'Home Instability–Moderate' and 'Multi–Risk Persistent'. Additionally, both Canter and Fritzon (1998) and Icove and

Estepp (1987) identified a propensity for juveniles within certain types in their studies; 'Instrumental Object' for Canter and Fritzon (1998) and both 'Vandalism' and 'Excitement' from Icove and Estepp (1987). There appears to be only one similarity found between Canter and Fritzon's (1998) and Icove and Estepp's (1987) juvenile firesetter typologies, that they set fires in groups. Canter and Fritzon (1998) reported these firesetters as belonging to their 'Instrumental Object' type and Icove and Estepp (1987) reported them as fitting into their 'Vandalism' type. Icove and Estepp's (1987) other juvenile firesetter typology, 'Excitement', has been identified as acting alone. Del Bove (2005) does not state whether or not his three different typologies acted alone, as part of a group or both. Thus, juvenile firesetters can be seen as an often distinctly different type of firesetters, sometimes simply due to the age of the firesetters themselves. It is suggested that there are particular motivations for this group and they appear the most likely to act in a group.

Discussion

Main findings of the review

When considering the studies as a whole, it is possible to extract relevant and empirically based variables from data gathered, despite confounding issues which are noted below. Together, the studies also highlight that it is also possible to identify clusters of firesetter crime scene behaviours and traits when analysing relevant and appropriate variables. Moreover, there was some crossover between the types of firesetters identified across the papers included in the review, such as the young firesetters having a propensity to share motivations of excitement and vandalism alongside being more likely to set fires in groups. Identifying a crossover between types can validate findings and identify areas that would benefit from further research.

Previous reviews and comparison to this review

Blumberg (1981) conducted a similar review of literature to this one, looking exclusively at typologies covering all firesetters. Blumberg (1987) and Lowenstein (2003) both completed reviews that were not systematic, therefore there was a greater possibility of bias in the selection of the studies. Some of the variables used by Blumberg (1987) are now considered obsolete by more recent research, for instance his inclusion of a pyromania diagnosis for some firesetters. In recent literature, pyromaniacs are considered to be extremely unusual and rarely diagnosed, such that they add very little to the wider understanding of firesetting typologies (Doley, 2003b; Geller, Erlen, & Pinkus, 1986; Lindberg, Holi, Tani, & Virkunnen 2005). This review was systematic and used more recent date range to ensure relevant papers only.

A comprehensive review conducted by Lambie and Randell (2011) looked at studies of child and adolescent firesetters. They also conducted a narrative review, which introduces the same possible biases as Blumberg (1987) and Lowenstein (2003). Lambie and Randell (2011) identified one typology (Del Bove, 2005), thus having only a very limited review of firesetter types. Despite having many more studies (30) on firesetting to compare than this SLR (6), Lambie and Randell (2011) came to similar conclusions regarding researchers' choice of firesetters. They highlight that the firesetting studies reviewed by them, identified firesetters through fire service, police or hospital records only. Lambie and Randell (2011) stated that the reviewed studies demonstrated an underrepresentation of the whole firesetting population and represent only the more severe firesetters rather than both minor and more serious firesetters. The same conclusion regarding accessing appropriate populations was also reached by this review, however this review had access to 8 more years' worth of research to select from. Additionally, this review was able to include a greater number of studies

addressing typologies to review than Lambie and Randell (2011), adding more weight behind the assertion that population selection for firesetter research remains limited.

Tyler and Gannon's review (2012) focused on mentally disordered firesetters and identified 69 studies to review. It was conducted as a structured literature review indicating a resilient process identifying studies. Tyler and Gannon (2012) did not identify or discuss typologies within the review. As with this SLR, Tyler and Gannon (2012) used references from studies to identify further research alongside the systematic search. They included these in their review suggesting similar difficulties to this author in identifying appropriate studies. The comparable approach lends support to the notion that this SLR collated studies for review in an appropriate fashion.

Finally, Lees–Warley and Rose (2015) conducted a review focusing on firesetters with low intellectual functioning. Their systematic review included a comprehensive description of search terms, making it repeatable and reducing bias in study selection. Their search resulted in 12 studies being identified for consideration. Lees–Warley and Rose (2015) did not discuss firesetter typologies and therefore, their review has not contributed further to this particular area.

Interpreting the review findings - Challenges

The six studies are representative of the current typologies that are subscribed to and referred to in other research on firesetting. Only one of these, however, was identified through the use of search engines and following the appropriate processes when conducting an SLR. The lack of appropriate studies identified by this SLR through the application of search terms, highlights the wide range of terms being used by those researching arson and firesetting. For example, differences in the way the

deliberately set fire is interpreted results in different descriptions, such as 'arson event', 'firesetting', 'deliberate fires' etc. Another confounding issue is when the study's reported aim or focus is indirectly related firesetter typology. For instance, the reported aim of the research and/or keywords used, covered topics such as 'better understanding' of firesetters or 'establishing lists of traits and/or behaviours which are more likely to be found in firesetters'. However, the research may also include a review or focus on developing firesetter typologies. This makes it less likely a relevant study will be identified through search terms alone. A wide variety and lack of uniformity of terminology within the research topic makes selecting appropriate search terms challenging.

The different countries the studies were conducted in, will likely have had some bearing on the different types of firesetters that may have been available for selection and inclusion in each study. This makes comparison between the studies challenging. There were two Australian studies (Green et al., 2014; Kocsis & Cooksey, 2002), however, they examined mentally disordered firesetters and serial firesetters respectively, making direct comparison not possible. The two Canadian studies (Del Bove, 2015; Harris & Rice, 1996) reviewed juveniles and mentally disordered firesetters respectively, which were also not directly comparable. It is important to remain mindful of the possible veracity of the interviewee in data gathered from police and fire service interviews. This is due to the complex influences that may be at play for a firesetter when being interviewed by someone in a position of authority/power for an offence for which they could be incarcerated. This was the case for four of the six studies: Canter and Fritzon (1998), Del Bove (2005), Kocsis and Cooksey (2002) and Icove and Estepp (1987).

Finally, each study had biases regarding the focus of the typology, for example Icove and Estepp (1987) and Canter and Fritzon (1998) focused on profiling. Both studies examined variables identifiable from a crime scene that would support investigators in identifying the firesetter responsible (Davis & Bennett, 2016). Other studies such as Del Bove (2005) focused on a wide range of indicators including information obtained from care givers allowing the focus to be much more on risk and identifying likelihood of recidivism. The conclusions drawn from this were focused on the variables linked to a risk of reoffending, leading to different emphasis on the firesetter types identified.

Interpreting the review findings - Strengths

Overall the data collection methods in each study was comprehensive and defensible. The Quality Assessments and Data Extraction forms used were thorough and comprehensive and result in an appropriate reflection of the studies. Information for research was obtained from police, fire service or patient records, which presumably would have been kept consistently and be a reliable record of information as they were official records submitted by a professional. Additionally, time frames employed by each study was extensive, ranging from 7½ years to 18 years. This suggests a wide range of firesetting event details, including annual differences, would have been included.

This review improves our understanding of firesetter typologies by drawing together differences and similarities between firesetter types. It allows for an overview of current understanding of firesetter typologies and the variables used. It also highlights the value added to our understanding of firesetters, of establishing a comprehensive firesetter typology. Previous reviews on research addressing firesetter

typologies is limited and much of what can be found is dated. This review, therefore, adds to the picture of a comprehensive overview of firesetting traits and behaviours and the benefits of identifying typologies to aid understanding. The review also ensures appropriate focus can be taken in future research, to inform the selection of appropriate firesetting populations are selected and studies have replicability with respect to variables used.

Difficulties with comparing typologies

Although there was some evidence of cross over in the types of firesetters identified across papers, there were also important differences. The outcome of this SLR highlights the difficulties in attempting to compare firesetter types based upon inferred offence motivation and relating this with crime scene behaviours. The different population samples that were drawn upon demonstrated this, for example, Canter and Fritzon (1998) identified a group of their firesetters who were labelled as having mental health problems and placed them within one typology, 'Expressive Object'. Harris and Rice (1996) and Green et al. (2002) focused on this sub–group exclusively and therefore, it could be argued that their types are a further subdivision of Canter and Fritzon's (1998) 'Expressive Object' firesetters. However, Harris and Rice (1996) and Green et al. (2006) have found different crime scene behaviours expressed within the sub–group of mentally disordered firesetters, suggesting that mentally disordered firesetters do not behave similarly when setting deliberate fires. These outcomes challenge Canter and Fritzon's (1998) findings and Davis and Bennett's (2016) theory regarding a consistency in crime scene behaviours within a type. The outcomes also challenge the general notion of consistency between firesetters' personality traits and their firesetting crime scene behaviours.

Also for consideration is the wide variety of variables selected for analysis by the various studies. Issues arise not just in terms of number of variables but also in terms of similarities and differences between each studies' variables. A larger number of variables could be seen as increasing confidence that typologies are truly representational of the firesetter type identified. However, comparison between the different studies is challenging due to the range of different variables utilised. Therefore, there is little consistency in what contributes to distinguishing types of firesetters across studies.

This SLR also demonstrates the challenges to be faced when defining firesetter types through establishing motivation due to the difficulties, already highlighted, in accurately identifying motivations. Using an approach focused on motivation also complicates attempts to draw together the different typologies identified in this SLR. For instance, where firesetting crime scene behaviours across firesetter typologies seem to match, but motivations do not , or when personality traits can be attributed to two or more different motivations to set fires. Thus, by including inferred motivations, developing a comprehensive and unified typology of firesetters becomes challenging.

Compounding these factors, only Del Bove (2005) included descriptive statistics. Therefore, it is not possible to compare differences and similarities between the different firesetters groups. Further difficulties in comparing typologies are experienced because of the variety of countries in which the studies were conducted which will have had differences in cultural, environmental, legal, attitudinal and societal norms. It is possible, therefore, that firesetters with similar traits and behaviours may be defined and dealt with differently in law courts, police stations and mental health hospitals from one country to another. Therefore, a selection process occurred before

firesetters were identified for inclusion in research which would have impacted on the types of firesetters available in each study.

In sum, the challenges with developing consistency in typologies across firesetting research, identified from this SLR, are likely to be due to two main factors. First, the differing populations used in the studies. Second, the difference in number and focus of the variables used to inform the development of the typologies. These factors add to the difficulties in comparing studies on firesetter types as well as replicability of findings.

Developing consistent typologies of firesetters

Despite the difficulties outlined above, it is possible to recognise some overlapping firesetter types with respect to consistently identified motives, such as revenge and anger. Mental illness has also been frequently reported within several of the typologies, suggesting consistency with this being a factor for some firesetters. It is also evident that children and young people are also reliably identified as a group of firesetters whose motivation is often cited as excitement and thrill seeking.

Theory driven typologies are likely to provide the most fruitful conclusions. The M–TTAF (Gannon et al., 2012) lends support to the development of some of the firesetter types identified in this SLR. Gannon et al. (2012) present an understanding of factors leading to individuals setting deliberate fires which in turn, they suggest, promote likely 'trajectories' of firesetters. These trajectories are based on critical risk factors, those most likely to trigger firesetting behaviour, and include: anti–social (i.e., criminal/offence supportive attitudes), grievance (i.e., self–regulation issues), fire interest (i.e., inappropriate fire interest), emotionally expressive/need for recognition

(i.e., communication problems) and multifaceted (i.e., offence supportive attitudes *and* inappropriate fire interest). This theory of firesetting, with the hypothesising of likely trajectories, lies neatly with some of the purported types identified, for example, Canter and Fritzon's (1998) 'Expressive Person' and the grievance trajectory.

Conclusion

The studies reviewed looking at identifying firesetter typologies are limited and have biases compromising attempts to provide a coherent approach to understanding firesetters. There are a number of ways further research can address some of the issues identified. The selection of the population is a critical element of this. The selection of firesetters for research is often done in such a way that low level firesetters are underrepresented (Lambie & Randell, 2011). Therefore, the selection of a full range of firesetters would be needed to provide a full representation of firesetter types. It is unclear at this stage how firesetters would be recruited, but it would be worth considering selecting individuals for research from a general population that included those who have arson convictions, those with mental health problems and those who do not form part of either of these sub–groups. It may also be of interest to gather data from all these individuals regarding their childhood fire interest and behaviour to further our understanding of adolescent/juvenile firesetting. Taking data from adults regarding their childhood firesetting may remove the issues presented when asking children to provide information to an adult in a perceived position of authority.

Future research would benefit from considering the variables utilised to identify typologies, in more detail. Although there was some crossover of variable types and themes, ultimately each study utilised different variables. Since these variables are the lynchpin in identifying firesetter types, they require much more focus and agreement in

future research. Successful identification of relevant variables will benefit from being underpinned by an appropriate and comprehensive theory of firesetting. The studies detailed in this SLR often concentrated on variables that provided more information regarding their specific sample population. For instance, Del Bove's (2005) variables concentrated on childhood and parental background reflecting the area of interest of the study, whereas Canter and Fritzon (1998) generated many more variables focused on firesetting crime scene behaviours.

The strength of considering these studies together lies in the level of detail and number of variables selected to provide insight into firesetters and their crime scene behaviours. Although the typologies identified may tend to be focused on a particular sub–group of firesetters and may not be theory driven in the selection of variables; the variables themselves provide a wealth of information about traits, characteristics and crime scene behaviours that are likely to occur together. The consistency within the identification of certain motivations as well as the identification of likely traits of a firesetter is valuable for treatment and investigative purposes (Davis & Bennett, 2016; Green, Lowry, Pathé, & McVie, 2014; Harris & Rice, 1996). Future reviews would benefit from identifying the most relevant variables that will discern between firesetters. This would support understanding of typologies through the selection of the variables with the best evidence base to be used in analysis, thus providing robust outcomes.

Chapter 3

Deliberate Firesetters: Typologies and Crime Scene Behaviours

Abstract

Previous research has assumed firesetter motivations or asked the offender to identify their motivation(s), which may be misleading because more than one motivation may exist for the firesetting behaviour and/or the firesetter may lack insight into their own motivation. Firesetter typologies have also focused on specific target populations, neglecting the comprehensive development of an overview of all firesetters and a fuller picture of firesetter types. In previous typologies, crime scene behaviour variables do not appear to have been selected using empirical evidence. Utilising evidence based crime scene variables would provide greater validity to the development of a firesetter typology. This study focuses on crime scene variables only—not inferred motivations—to discern between firesetting types. This study utilised data recorded from deliberately–set–fire crime scenes, taken from the second largest Fire and Rescue Service in England, the West Midlands Fire Service (WMFRS). Data was recorded by Fire Officers for all fires, both deliberate and accidental, attended by the WMFRS between 2016 and 2018. The data consisted of 9,541 incidents of deliberately set fires, each of which was coded for to examine the presence or absence of 15 crime scene variables (e.g., 'Weekdays', 'Night time', 'Car/vehicle', 'Autumn' etc.). Multi–Dimensional Scaling (MDS) analysis was applied with a statistically robust and significant outcome demonstrating the identification of three firesetting types. These firesetter types are compared to current knowledge of firesetting types and areas of similarity were found with established typologies. Areas for fruitful research in the future are suggested in light of these findings.

Introduction

With such low detection rates and the potential to cause devastation (see Chapter one), it is clear there is a need to further develop our understanding of firesetters and firesetting behaviour. Theories of firesetting have been developed over the last 100 years and attempt to create a framework for those working with firesetters. Through ongoing development of our understanding of firesetters it is possible to improve effective intervention work, manage risk and increase detection (Davis & Bennett, 2016; Gannon, Ó Ciardha, Doley & Alleyne, 2011).

Theories of firesetting

Three multifactor theories have been presented to explain deliberate firesetting, discussed in Chapter one: Dynamic–Behaviour Theory (DBT) proposed by Fineman (1980), Functional Analysis Theory (FAT) developed by Jackson, Glass and Hope (1987) and Multi–Trajectory Theory of Adult Firesetting (M–TTAF) created by Gannon, Ó Ciardha, Doley, and Alleyne (2012).

DBT attempted to demonstrate that negative developmental experiences (biopsychosocial factors) prompted deliberate firesetting (Fineman, 1980). The author proposed the argument that previous and current environmental factors reinforced antisocial and firesetting tendencies in the firesetter. Further, that positive experiences (internal and external) reinforced their firesetting behaviour (Fineman, 1980).

Jackson, et al. (1987) proposed FAT, which argued that biological factors coupled with dissatisfaction with life and a perceived inability to effect change, alongside poor social skills and a trigger event, are critical elements contributing to firesetting behaviour. Jackson, et al. (1987) further suggested that these individuals would also

experience a build–up of anger and frustration which would lead to setting a fire to regain a sense of control over their life and environment.

M–TTAF, developed by Gannon, Ó Ciardha, Doley, and Alleyne (2012) shows particular promise as an understanding and explanation for firesetting behaviour; as it has been developed through integrating previous theories and explanations of firesetting. The M–TTAF has done this by drawing together the strongest parts of previous theories of firesetting into a comprehensive framework (Gannon, 2016). It incorporates biological, developmental, psychological, cultural and social factors into two tiers to explain an overall understanding of firesetters.

Firesetting typologies

The development of typologies is an important addition to attempts to understand firesetters and how they behave. Categorisation helps develop our understanding, aiding better awareness of the most pertinent, biological, psychological, social and behavioural variables influencing firesetters. This benefits services and public bodies tasked with managing firesetters and arson risk and allows them to focus already stretched resources on appropriate prevention projects and intervention work to reduce recidivism (Doley, 2003a). Firesetting typologies can also aid profiling to support investigation and detection, particularly when focused on crime scene behaviours and their relationship to characteristics of offenders (Davis & Bennet, 2016; Icove & Estepp, 1987). Unfortunately, there are few validated and commonly used typologies to support an understanding of firesetters (Gannon & Pina, 2010; Lambie & Randell, 2011; Lees–Warley & Rose 2015; Prins, 1994; Tyler & Gannon, 2012). Despite the lack of research on this topic, there have been some significant attempts to categorise firesetters over the past seven decades. Chapter two systematically

investigated the typologies of firesetters from six studies and below are four of the most well recognised and empirically validated typologies. Three of these were identified in the systematic review in Chapter two; the fourth, Lewis and Yarnell's study conducted in 1951, is included due its early role in providing impetus and direction for subsequent research in firesetting typologies (Doley, 2003; Gannon & Pina, 2010). It was not possible to access the original publication.

Lewis and Yarnell, in 1951, was an early attempt to profile and categorise firesetters and was one of the largest systematic pieces of research on firesetters (cited in Doley, 2003a). They analysed 1,500 firesetters and identified five types of firesetters according to reported or inferred motive and age (cited in Rice & Harris, 1991). The five types were: 'Profit', 'Children', 'Accidental', 'Delusional', 'Revenge' or 'Sexual thrill' (including pyromania) (cited in Gannon & Pina, 2010). Lewis and Yarnell identified the firesetter typologies utilising a variety of different sources of information, including police, psychiatric services and fire services records (cited in Doley, 2003a; Gannon & Pina, 2010). Due to a range of different sources of information being made use of, it is still considered one of the most comprehensive attempts at identifying firesetter types (Doley, 2003a; Gannon & Pina, 2010). This research focused on the expression of emotion being the cause of firesetting behaviour, with subsequent research duly following this focus on motivation as a way to categorise firesetters.

However, focusing on motivation has its drawbacks, for instance, the firesetter may not have insight into their own motivation, it is also possible that more than one motivation exists for the firesetting behaviour (Doley, 2003a; Rider, 1980). Another criticism is that the cases used for study were not random or representative of all firesetters, therefore bias could have arisen through their selection for study by the

researchers by staff at mental health hospitals, insurance underwriters and fire investigators (Rice & Harris, 1991). Finally, approximately 60% of those identified were diagnosed as having pyromania traits (cited in Rider, 1980). However, recent research demonstrates a much lower frequency of pyromania, for example, Lindberg, et al. (2005) identified only 3 pyromaniacs out of a sample of 90 firesetting individuals from a psychiatric. This throws into doubt how representative of firesetters Lewis and Yarnell's sample is. Despite these and other issues, the size of the sample and the fact that some of the outcomes have been replicated lends some credence to their findings.

Icove and Estepp (1987) continued with the focus on motivation and utilised Police interviews with 1,016 suspects charged with arson (as defined by USA law) and selected 22 variables to inform firesetter typologies. They acknowledge Lewis and Yarnell's research, however, they are critical of research that focuses on motivations and are driven from a psychiatric viewpoint. Icove and Estepp (1987) argue the importance of research based from a law enforcement perspective and the value of developing investigative leads from research. They also state that the lack of range and variety of firesetters identified for previous research is another problem in providing a truly representative picture of firesetting (Icove & Estepp, 1987). Their research identified six types: 'Vandalism', 'Excitement', 'Revenge', 'Profit', 'Crime concealment' and 'Other'. These types continue to represent the possible motivations of firesetters label. Both Icove and Estepp (1987) and Lewis and Yarnell (cited in Doley, 2003a) identify those setting fire for reasons of 'Revenge'. Additionally, there is some overlap between Icove and Estepp's (1987) 'Excitement' and 'Vandalism' and Lewis and Yarnell's 'Sexual thrill' and 'Children', respectively (cited in Doley, 2003a). The majority of firesetters, (88%) were represented by 'Vandalism', 'Excitement' and 'Revenge'. Of note, 'Other' firesetters (8%) is a catch-all firesetter type, including all

those firesetters whose behaviour or motivations are not consistent with the previous five typologies or where motive is unknown.

As with other firesetter typology research, the sample identified by Icove and Estepp (1987) were all apprehended firesetters and therefore it is not possible to know to what extent they are representative of all firesetters. The 'Other' firesetter type is troublesome as it does not appear to be a consistent group and presents as including 'loose ends' that did not fit into any of the previously detailed types. No theoretical underpinning is presented by Icove and Estepp (1987) to explain the different types they identified and it seems the research relies on the firesetters providing their own motivation or this being assumed by the researchers. Those selected for inclusion in the research were also interviewed by fire or police officers, which perhaps limited the extent to which they were able to be honest about their behaviour and motivations. However, there are benefits to this typology of firesetters, for example, the research is comprehensive in the number of firesetters involved in the research and that they were not a selected sub–category of firesetters, such as psychiatric patients, or juveniles. This supports it as a useful typology in encapsulating a wide range of all those caught for firesetting.

Canter and Fritzon (1998) identified four types of deliberate firesetters based on motivation and offence behaviours. Data was collected from Police interviews with 142 firesetters. Sixty four variables were identified and analysed and covered demographic information, crime scene behaviours and Police observations. Using Small Scale Analysis (a type of MDS), the authors identified the following types: 'Expressive Person', 'Instrumental Person', 'Expressive Object' and 'Instrumental Object'. 'Expressive Person' firesetters were focused on setting a fire due to a strong emotional

response and set fire to things that had a personal connection to them, for example the house of someone they knew. 'Instrumental Person' had a specific outcome or purpose in mind when setting the fire and set fire to something that had a personal connection to them. The 'Instrumental Object' firesetters were setting a fire for a particular gain or purpose and set fire to an item/building that had no personal connection to them. Finally, 'Expressive Object' were setting a fire because of a need to express a particularly strong emotion and set fire to things that were not personally related to them. The typologies were informed by the theoretical model of instrumental and expressive anger. The research demonstrated the value of including crime scene behaviours to inform firesetting types and included an impressive number of variables.

However, there are some drawbacks to Canter and Fritzon's research. For example, the types were based upon those identified and brought in for interview by the Police on suspicion of one or more arson offences. This means those included in the analysis would have not have necessarily been representative of all firesetters, only those identified and considered worth further action by the Police. It could mean that these were the more serious firesetters who were thought worth the investment of Police resources and at a greater likelihood of getting a conviction from. Some of the variables relied on subjective judgements of police officers arresting the suspected firesetters. For instance, mental illness was identified as present if the police recorded strange or unusual behaviour in the suspected firesetter. Despite these issues, this typology contributes to our understanding of firesetters and firesetter types because of the wide range of firesetters it selected for analysis and the wide range and number of variables.

Five types were identified by Kocsis and Cooksey (2002) through Fire Service interviews of 148 individuals suspected of setting fires. They were: 'Common',

'Thrill', 'Anger', 'Wanton' and 'Sexual' and identified through analysing 71 variables using MDS. These variables covered crime scene behaviours, event–specific offender behaviour and choice, general offender behaviour, and personal offender characteristics. The variables were inputted as dichotomous values of being either absent or present and MDS analysis was used. 'Common' firesetters represented those whose behaviours and traits were most frequently recorded and therefore Kocsis and Cooksey (2002) concluded these represented the majority of firesetters. These firesetters had traits such as planning the arson event, targeting a building that was related to them, for example school or workplace, and was occupied at the time. They were often minor fires with a single point of origin and this was often at the entrance of a building which the offender had to enter in order to set the fire. There was often theft prior to the fire, the building had some form of security system for fires, such as a sprinkler system, and the offender had left physical evidence at the crime scene. Those that were identified as 'Thrill' firesetters were focused purely on the excitement and draw of setting a fire and watching things burn. Those identified as 'Anger' firesetters were individuals for whom firesetting behaviour serves a purpose in terms of providing an outlet for angry feelings. The 'Wanton' firesetters are motivated by seeking wanton destruction and fire is deemed a good vehicle for this. Finally, the 'Sexual' firesetter was identified as an individual who had a sexual motivation, experiencing sexual excitement from setting fires.

Despite the wide range of variables used and comprehensive covering of firesetter behaviours, there remain some concerns with Kocsis and Cooksey's (2002) typologies. For instance, the utilisation of variables did not appear to be evidence based and some previously unused variables such as whether or not they had a strong accent or long hair were included. Some of the variables were subjective such as the

attractiveness of the firesetter and whether or not their teeth were noticeably imperfect, had an 'outstanding physical feature' or 'noticeable odour'. These queries regarding the relevancy and accuracy of the variables selected raise concerns regarding the validity firesetter types themselves, due to the types being based upon these variables. Kocsis and Cooksey (2002) also appeared to make assumptions in some of their reporting of results, for example, linking the attractiveness and age of a firesetter type to motivation. They stated that "the fact these offenders are typically older and physically unattractive may suggest sublimation of possible sexual drive" (p.648). The typologies of Kocsis and Cooksey's (2002) are useful in identifying the most common firesetting crime scene behaviours and contribute positively to the identification of relevant firesetter variables based upon this. However, they developed their firesetter types on extrapolating the motivation of the firesetter at the time and selecting and utilising variables without evidence base. Thus, this typology has serious issues regarding the validity and robustness of the data and variables used to underpin the types.

Limitations in current research

Although research about firesetting typologies has been beneficial in beginning to identify different typologies and behaviours that are likely to be linked, there continue to be a number of limitations in the existing literature (Gannon, et al., 2012).

One concern is that typologies have been based upon *small sub–sections of firesetters* who may be un–representative of all firesetters, for example, psychiatric patients, children and serial arsonists. As such, the literature as a whole provides little consistency or a comprehensive overview to our understanding of firesetting (Canter & Fritzon, 1998; Doley, 2003a; Harris & Rice, 1996; Icove & Estepp, 1987; Kocsis & Cooksey, 2002). It is evident that identifying truly representational populations of

firesetters is a critical and challenging element of research on this topic. Lambie and Randell (2011) stated that the selection of firesetters for research is often done in such a way that firesetters who set small and less-damaging fires are underrepresented. This could be because the FRS are not called due to firesetters controlling the fire themselves, the fire burning itself out or that the police did not deem it worth further investigation for a variety of reasons. Therefore, these firesetters do not come to the attention of the authorities and subsequently are not selected by researchers to study. The approaches taken so far, to identify firesetters for study, fail to capture all types of firesetters, casting doubt on the likelihood of current firesetter typologies being representative of the full range of firesetters and firesetting behaviours.

Instead of focusing on sub-samples, analysing data that includes a wide range of firesetters would likely provide a better representation of firesetter types. This would provide a more comprehensive understanding of firesetting and firesetting crime scene behaviours, which in turn would ensure that only accurately identified relevant lines of enquiry are pursued for further investigation. Identifying potential areas of risk and propensity to set fires would benefit from attempts to include all firesetting, irrespective of possible sub–group traits. Utilising the data from all deliberately set fires over a set period which includes all types of seasons and seasonal holidays as well as across a specific geographical area will better support inclusion of all types of firesetters for analysis. In this way, the fire crime scene behaviours will be a better representation of the majority of firesetters who have not been caught setting fires. It is possible that those who remain un–apprehended may respond differently to local and national prevention programmes and strategies. For instance, firesetting could be part of an individual's wider pattern of general antisocial or criminal behaviour meaning an intervention may be more effective if developed taking this into account (Canter &

Almond 2002). Having a comprehensive understanding of these types of individuals alongside those who are caught will support the development of more responsive and appropriate interventions and strategies which in turn will improve the effectiveness these approaches may have on all firesetters.

A second concern is that the previous literature *relies on firesetters reported or inferred motivation* or other subjective variables. Attributing motivation has long been held as an imperative to understanding firesetters, especially with respect to treatment (Doley et al., 2016). However, it remains unclear to what extent firesetters are aware of or insightful regarding their reason(s) for setting fires (Ducat & Ogloff, 2011). Ducat and Ogloff (2011) also queried the identification of different motivations as being truly representational of all firesetters due to them being predominantly based upon apprehended firesetters. Prins (1994) raised concerns that there may be more than one motivation and that motivations can be very complex. In particular, Prins (1994), raised concerns regarding the utilisation of motivation for discerning types of firesetters. Within typologies, motivation is often surmised or inferred through the firesetters actions and crime scene behaviours (Canter & Fritzon, 1998; Icove & Estepp, 1987; Kocsis & Cooskey, 2002). Ducat and Ogloff (2011) state the need for further research to confirm that behaviour is an accurate portrayal of underlying motive. Therefore, identifying firesetter types through imposed or disclosed motivations is moot, due to possible lack of insight, the possibility of more than one motivation and questionable connection between behaviour and motive.

Instead of relying on subjective data attempting to infer firesetters' motivations post-hoc, objective crime scene behaviours can be used independently to identify more robust firesetter typologies. There is a recognised link between crime scene behaviours

and offender characteristics with the link being particularly strong in crimes of arson, compared to sexual assault and murder (Davis & Bennett, 2016). It is these links which are often used to aid police in their investigative process or to link crimes (Davis & Bennett, 2016). The studies discussed above used a wide range of variables in their analyses; some included crime scene information, such as the target of firesetting, or the time of day and year. Annual and seasonal differences are regularly recorded by the FRS and can demonstrate patterns of behaviour that inform their firesetting prevention strategies. Developing understanding of the impact different crime scene behaviours have on firesetter types, as well as whether or not they add value to developing typologies, continues to be an important part of establishing valid firesetter typologies.

Current research recognises that playing with fire and experimentation is likely to be widespread and a normal part of growing up, peaking in incidence between 12 and 14 years (Tiffin & Cooper, 2006). It is also likely that most deliberate fires set by this group of firesetters do not conclude in a call out to the FRS and thus are largely undetected and unreported (Tiffin & Cooper, 2006). Canter and Almond (2002) report that firesetting that does result in a callout to the FRS is also strongly linked to young people. The authors report 36% of all property arsons and 39% of all vehicle fires are committed by someone aged 18 years or under. Canter and Almond (2002) also put forward the argument that adolescence are more likely to set fires as a form of vandalism and as such, are significantly more likely to set fire to vehicles. This research highlights the empirical evidence supporting the argument that a large number of firesetters who are un–apprehended are likely to be adolescence and/or children. Establishing the true proportion of this type of firesetter across all fires set would be beneficial in understanding those more at risk of setting fires and those likely to have engaged in this behaviour singly or in groups. This clearer picture would benefit those

working alongside firesetters in detection, managing risk and developing and delivering interventions. Making links between firesetting behaviour and the firesetters' identifiable features would also provide support for the authorities in identifying and managing the risk firesetters pose. For example, according to Canter and Almond (2002), adolescent firesetters are more likely to set fires local to them and originate from areas of social deprivation which are areas that are also likely to have higher incidences of accompanying antisocial behaviour. Thus, it is possible that the majority of un–apprehended firesetters are young males, who set a small number of fires and possibly as part of a group (Canter & Almond, 2002). Research encompassing crime scene behaviours from as wide a range of firesetting as possible, will demonstrate a more accurate picture of the most common firesetting crime scene behaviours. It is also more likely to include the types of firesetting found by Canter and Almond (2002) and Tiffin and Cooper (2006), which are either under–represented in other research or focused on exclusively. Through including objectively recorded firesetting crime scene behaviours from both apprehended and un–apprehended firesetters, a better proportional representation of crime scene behaviours will be achieved and a more accurate picture of all types of firesetters can be developed. Having a more robust understanding of firesetting behaviour can inform investigation focus, risk assessment and interventions.

A final concern is that there is *no universally accepted approach establishing which crime scene behaviours and traits are truly representational of firesetting types*. Crime scene behaviours and traits are used to develop variables for analysis and, therefore, are the basis on which identifying typologies are devised. Selecting relevant, evidence-based traits and crime scene behaviours to be used as variables influences how different firesetter types are understood and perceived. Thus, reaching a consensus regarding which reported crime scene behaviours and traits are most representative of

the different firesetter types is critical. For instance, a typology may include data that is irrelevant to identifying typologies in firesetters. This irrelevant data, when using MDS analysis, could (depending on frequency) 'pull' the data points (variables) closer to or further away from other data points, implying a closer or more distant relationship between variables than is accurate. This would then influence the positioning of the clusters of variables and affect the division of the scatterplot and identification of types. Some variables do not appear to have a theoretical underpinning for inclusion, for instance, a trait such as attractiveness was judged subjectively by Kocsis and Cooksey (2002), without an evidence based justification as to why it would be relevant to include such a variable to develop types of firesetters. Additionally, some conclusions drawn from attempts to interpret the firesetter types developed from both relevant and irrelevant data variables, seem tenuous. For example, Kocsis and Cooksey's (2002) suggested that less attractive individuals are less likely to have intimate relationships and therefore set fires to express their repressed sexual feelings.

Firesetting typologies are based on frequency of variables and in what ways they combine together to create a type. Being able to identify the different frequency rates of all firesetters will provide a more comprehensive understanding of what is 'common' or 'normal' firesetting behaviour. This has a number of uses including; identifying unusual or atypical behaviour which could facilitate structured professional judgement supporting defensible profiling, understanding normative behaviour to inform fire prevention strategies or to assist a greater ability to link similar firesetting incidents to aid detection of possible serial firesetters. Therefore, further research utilising data drawn from a wider group of firesetters could help highlight relevant firesetting variables and identify those that appear to impact upon identification of a firesetter type. Identifying the relevant firesetting behaviour variables will support offence linkage,

conviction and treatment (Doley, 2003a; Ellingwood, Mudford, Bennell, Melynk, & Fritzon, 2012; Tyler & Gannon, 2012).

From this body of research and in order to reflect areas requiring further investigation this study has the following aims and hypotheses:

Aims

i) Establish the 'typical' or most common firesetting crime scene behaviours through examining the frequency of firesetting crime scene behaviours.

ii) Establish if there are distinct types of firesetting crime scene behaviours using only crime scene information gathered by Fire Officers from all deliberate fires set in WMFRS between 2016 and 2018.

iii) Compare firesetting crime scene behaviours in this data set with the crime scene behaviours of the types of firesetters identified by Icove and Estepp's (1987), Canter and Fritzon's (1998) and Kocsis and Cooksey's (2002) firesetter typologies.

Hypotheses to be tested

- There is a 'typical' profile of firesetting crime scene behaviours that represent the majority of deliberately set fires.
- Firesetting crime scene behaviours represent types which are consistent and distinct from each other.
- Elements or the entirety of Icove and Estepp's (1987) and/or Canter and Fritzon's (1998) and/or Kocsis and Cooksey's (2002) deliberate firesetter typologies can be reproduced within the current data set using only crime scene behaviours.

Method

Ethical considerations

This research project was submitted to the Research Support Group at the University of Birmingham and no further ethical review was required (reference number ERN 18-0933).

Sample

The sample is data collected by the WMFRS between 1st April 2016 and 31st March 2018. Data were recorded by Fire Officers on the Incident Recording System (national FRS data gathering form) and were requested through the Freedom of Information Act (2000). The data included 20,427 fires, both deliberate and accidental, that were responded to by the WMFRS. Only data on fires identified as deliberate by the Fire Investigation Officer, who used their experience and knowledge to judge whether a fire had been intentionally set, were utilised. The accidental fires were removed from the data set, so that only those that were 'thought to be' or 'suspected to be' deliberate, some of which would also meet the legal definition of 'arson' in the Criminal Damage Act of 1971, were included for analysis. There were 9,541 deliberate fire incidents responded to by WMFRS in this time period, which they recorded as either primary (2,936) or secondary (6,605) fire incidents. A primary fire incident is one which is considered a more serious fire due to the likelihood that it could cause harm to people or damage to property. Fire Officers record fires as primary only if the fire occurred in a (non-derelict) building, vehicle or outdoor structure, involved fatalities, casualties or rescues, or was attended by five or more pumping appliances. Secondary fires, on the other hand, are generally small outdoor fires and do not involve people or property (see appendix 6 for full set of WMFRS data and how data was sorted into variables that were inputted for analysis).

The data provided by WMFRS included the date and time of the fire, from which it was possible to extrapolate the day of the week, month, season and whether there was daylight at the time of the call to WMFRS. Weekdays were operationalised, following Canter and Fritzon (1998), as starting at midnight on Sunday and running through to 16:00 on Friday. Following Canter and Fritzon's (1998) approach was appropriate because their participants were also English arsonists and the types identified in their research are the most widely replicated in subsequent research. Daylight was established through the recorded time of sunrise and sunset during the middle of each month, which was then applied for the entire month. To ensure that night time was only coded when there was darkness, an extra half an hour was permitted for both sunrise and sunset. This accommodated daylight continuing after sunset and beginning to get light before sunrise. Seasons were based on the widely accepted format of December, January, and February as winter; March, April, and May as spring; June, July, and August as summer; and September, October and November as Autumn. Note that Canter and Fritzon (1998) did not include seasons in their analyses, but seasons were included for comparison to Icove and Estepp's (1987) work.

The firesetting crime scene behaviours provided by the WMFRS that were concerned with target choice, for example bins, kiosk, café etc., were grouped together into variables according to Canter and Fritzon's (1998) categorisation of target variables. For instance, the WMFRS target variable of 'Bins' was included in 'Miscellaneous/Derelict/Uninhabited' variable for analysis and the WMFRS target variable of 'restaurant' was placed into 'Business'. Thus, the target variables provided by the WMFRS was sorted according to Canter and Fritzon's (1998) target variable names (detailed in appendix 6). Once all the data (target, time of day, weekdays etc.)

was reduced as outlined above, it comprised of 15 variables. All variables inputted for analysis were similar to or directly overlapped crime scene behaviour variables already identified and utilised to develop typologies by Kocsis and Cooksey (2002), Canter and Fritzon (1998) and Icove and Estepp (1987) (see Table 5). These were considered the most relevant studies in terms of selecting comparable firesetter samples and their choice of variables having a theoretical basis, see Chapter one for an overview of firesetting theories.

The WMFRS data also included the target of the fire and the ward (i.e., local authority area) in which the fire occurred, as well as whether the fire was considered primary or secondary. Those deliberately set fires which were identified as primary also included the source of ignition (e.g. paper, rag, lighter etc.) as well as whether or not accelerant was used. Due to the lack of data on accelerant and source of ignition for the secondary fires, these crime scene behaviours were not recorded widely enough across all fires to prove usable. Additionally, the ward data were not specific enough for anything useful to be gleaned, because the wards span large geographical areas and cover large numbers of residents. The smallest ward covers just under 75,000 hectares and the largest is over 1 million hectares. The residential population in the wards ranged from 3,000 residents in the least populated ward, to over 95,000 residents in the most populated ward. Therefore, it was deemed too imprecise to generate a useful outcome through analysis due to geographical profiling using much more precise locations (Laukkanen, Santtila, Jern, & Sandnabba, 2008).

Statistical analysis of variables

First, a frequencies analysis was conducted to determine the characteristics of the fires in the dataset. Following this, a Multi–Dimensional Scaling (MDS) analysis

was completed using the PROXSCAL programme in SPSS. MDS is grounded in Factor Analysis but also allows for results to be displayed visually in the form of a scatterplot as a visual representation of factors. MDS caters for both metric or non–metric

Table 5

Presence of variables in WMFRS data and in three established typologies

Variables	WMFRS Data (2106–2018)	Kocsis & Cooksey (2002)	Canter & Fritzon (1998)	Icove & Estepp (1987)
Weekday	Y	Y	Y	Y
Weekend	Y	Y	Y	Y
Daylight	Y	Y	Y	Y
Night time	Y	Y	Y	Y
Spring	Y	Y	N	Y
Summer	Y	Y	N	Y
Autumn	Y	Y	N	Y
Winter	Y	Y	N	Y
Residential	Y	Y	Y	Y
Business	Y	Y	Y	Y
Civic Building	Y	Y	Y	Y
School/Educational institution	Y	Y	Y	Y
Car/Vehicle	Y	Y	Y	Y
Hospital	Y	N	Y	Y
Miscellaneous, Uninhabited or Derelict buildings or items[1]	Y	Y	Y	N
Total Number of variables included	15	14	11	14

Note. Presence of variable in study: Y = Yes, N = No

[1] uninhabited buildings, derelict buildings and bushland, grassland, bins etc. (see appendix 2 for more details).

techniques, can be applied to ordinal, nominal or ratio data and constructs a geometrical representation of a proximity matrix (Groenen & Borg, 2013; Jaworska & Chupetlovska–Anastasova, 2009). Trojan and Salfati (2011) state MDS works best with between 10 and 15 variables as a higher number makes it difficult to identify meaningful patterns from the plot due to the high amount of overlap that occurs.

The aim of MDS is to physically represent the underlying (dis)similarities and strength of association between variables, utilising Euclidean distance principals (Groenen & Borg, 2013; Jaworska & Chupetlovska–Anastasova, 2009; Kruskal & Wish, 1978). MDS can be used to test the hypothesis of the existence of particular structures and strength of association between variables within a data set and, therefore, has advantages in terms of its application within crime scene behaviour profiling. This is done through establishing the frequency with which crime scene behaviours co-occur. This analysis will identify whether certain firesetting behaviours occur together at a statistically significant level, whilst allowing the different relationships between many variables to be understood at the same time (Bishopp & Hare, 2008; Canter & Heritage, 1990). Due to these properties, it has been utilised in developing our understanding of how firesetting typologies can be identified through crime scene behaviours. This approach has been applied to the development of typologies for sex offenders, murderers, stalkers and deliberate firesetters (Goodwill, Alison, & Humann, 2009; Groenen & Borg, 2013; Häkkänen, Lindlöf, & Santtila 2004; Häkkänen, Puolakka, & Santtila 2004; Salfati & Dupont, 2006; Youngs, Ioannou, & Straszewicz, 2013).

Variables were treated as yes/no values (present or absent) in keeping with previous MDS and crime behaviour analysis (Canter & Heritage, 1990; Goodwill, Harrison, & Humann, 2009; Häkkänen, et al., 2004; Trojan & Salfati, 2011; Youngs,

Ioannou, & Straszewicz, 2013). Goodness of fit is expressed in several formulations known as the stress index. Within the PROXSCAL approach *raw stress* is reduced through a series of iterations of the scatterplot to identify the best fit representation of the plots and their relationship to one another. Kruskall's *stress* (known as *stress I*) is considered the best indicator of goodness of fit and is widely cited in literature as a guide as to whether the results are interpretable. These are predominantly considered due to their simplicity and flexibility. Stress ranges between 0 (perfect fit) and 1 (worst possible fit), although, as a rough rule of thumb Kruskal proposed anything greater than 0.20 is not tolerable and below 0.05 is satisfactory (Jaworska & Chupetlovska–Anastasova, 2009). Clarke (1993) reported that 0.20 is usable but not necessarily reliable. It should be noted that, despite this cut-off being widely utilised, it is considered an oversimplification (Mair, Borg, & Rusch, 2016).

A more nuanced use of goodness-of-fit is dependent upon the number of variables used. A greater number of variables (typically over 10) can increase raw stress levels without the results necessarily becoming uninterpretable (Green, 1975). Therefore, running a stress curve will delineate an 'elbow' at the number of dimensions that best represent the data. This is based on it indicating the minimum number of dimensions and stress whilst still having interpretable results. This can also mean a greater score for Kruskal's stress level whilst still allowing for the rejection of the null hypothesis of no meaningful relationship between variables (Green, 1975). With the 15 variables used for this data, across 2 dimensions, results are significant and interpretable as long as Kruskal's stress fall below 0.24 (Green, 1975).

MDS also calculates the coefficient of contiguity which demonstrates whether the data has a meaningful interaction, measured by Tucker's coefficient of congruence.

Dispersion Accounted For (DAF) demonstrates whether there is a normally distributed data set. Both Tucker's coefficient and DAF are required to be over 0.95 demonstrate a 'good' outcome.

Results

Fire Characteristics

Altogether, 61% of the deliberate fires were set during the weekdays and 52.1% were set during hours of darkness. Of the deliberate fires set across a year, 32% were set in Summer, 27.3% in Spring, 25.2% in Autumn and 15.5% in Winter. The items targeted were predominantly miscellaneous, uninhabited or derelict buildings, structures or items (73.8%); with cars and vehicles being the next most targeted (18.7%). Only 4.7% of targets were residential properties, 1.5% were hospitals/institutions, 1% were businesses, 0.2% were schools, and 0.1% were civic buildings.

Multi–Dimensional Scaling Analysis

Interpretability and reliability

Figure 3 is a scree plot demonstrating the 'elbow' at which the number of dimensions to be used for MDS is identified. This is plotted to identify the point at which normalised stress becomes tolerable. The scree plot demonstrates a two-dimension solution for this data set.

Figure 4 is the scatterplot of the two–dimensional MDS solution, where each point of the plot represents a crime scene behaviour variable. The closer two points are on the plot, the more likely the items are to co–occur in offences. The *raw stress* of the MDS solution was 0.04 which represents 'perfect' goodness of fit ("Multidimensional Scaling," n.d.). Kruskal's *stress I* was 0.20, falling below the maximum acceptable of

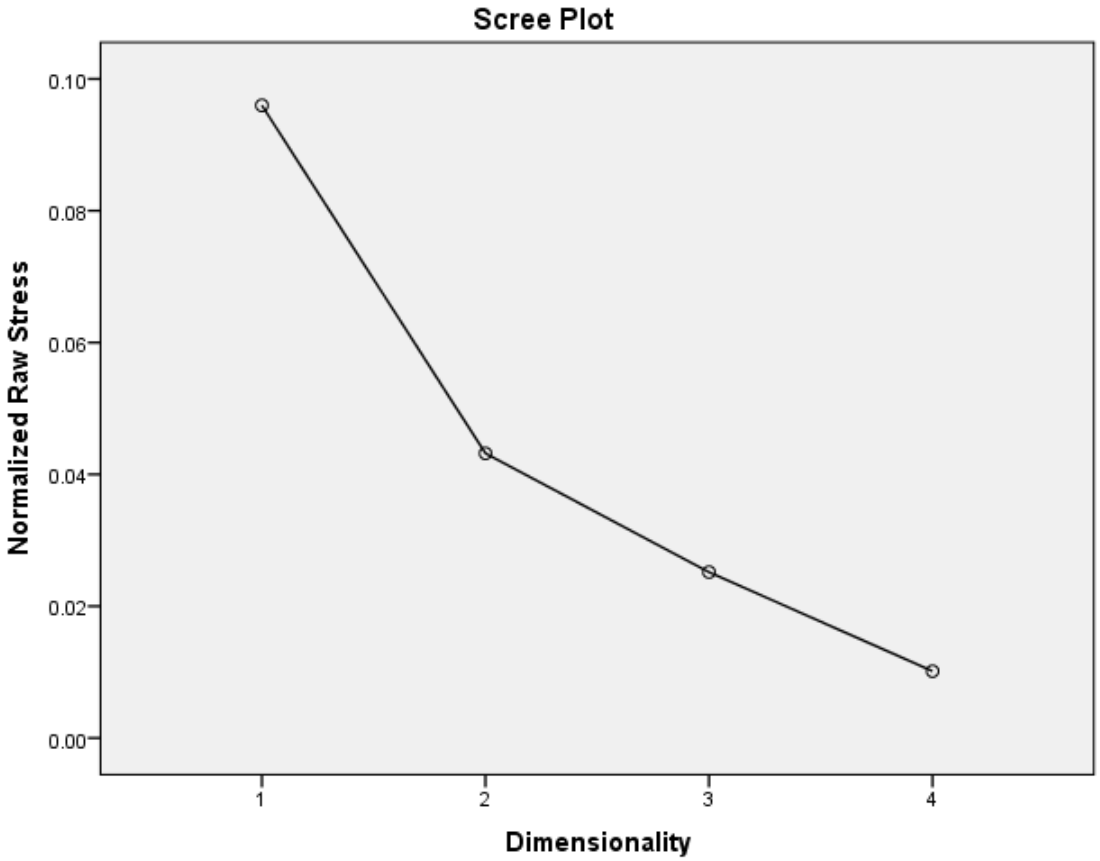

Figure 3. Scree plot demonstrating the 'elbow' effect at the 2nd dimensionality

0.24 for 15 variables. Tucker's coefficient of congruence was 0.98 and DAF was 0.96. Together, these outcomes demonstrate that the results of the MDS are interpretable and Figure 4 illustrates an acceptable representation of the similarities between the variables (Jaworska & Chupetlovska–Anastasova, 2009).

Thematic structure of the behaviours

In Figure 4, the closer the variables are to the centre, the higher the frequency of occurrence. Conversely, the variables that are spread towards the edges, occur with decreasing frequency. The highest frequency variables of this study were the 'Miscellaneous, Uninhabited or Derelict' target (73.8%), 'Weekday' (61.1%) and 'Daylight' (47.9%). These are identified in the oval in Figure 2 and demonstrate the 'common' firesetting behaviours, representing behaviours that might be expected by the

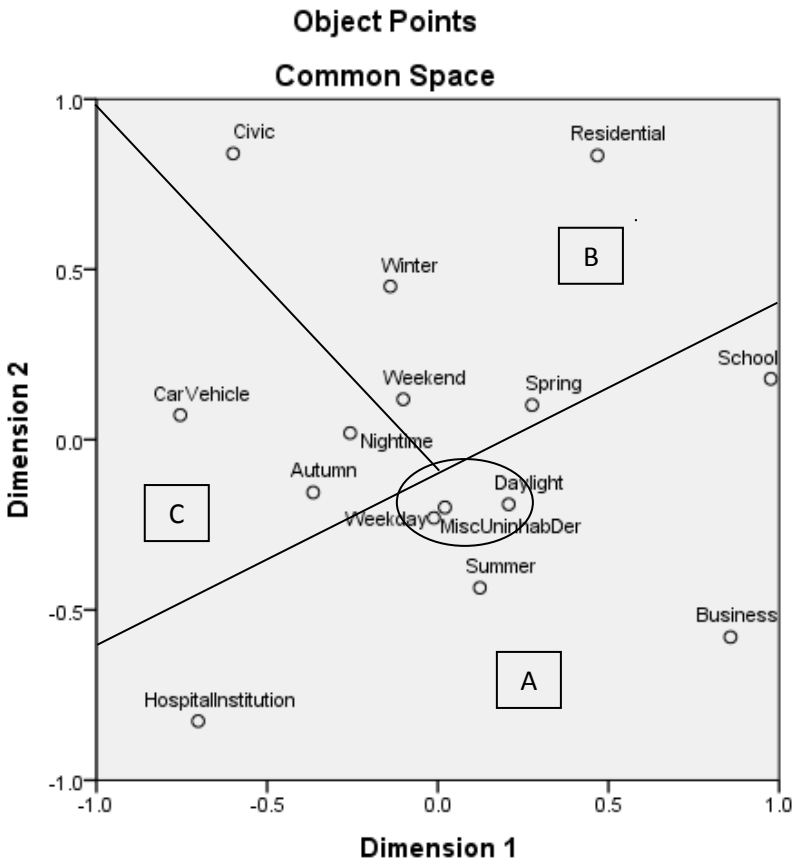

Figure 4. Two–dimensional MDS solution, containing 15 crime scene behaviour variables and the three types of firesetters identified ('A', 'B' and 'C'). The variables inside the oval reflect the highest frequency, co-occurring variables

majority of firesetters in this sample. The two least frequent variables were 'Civic' (0.1%) and 'School' targets (0.2%). The next least frequent variables were 'Business' (1%) and then 'Hospital Institution' targets (1.5%).

Next, to differentiate between types of deliberate firesetters, Figure 4 was interpreted following guidance on interpreting MDS scatterplots by Greonen and Borg (2003). These authors report that there are three possible ways for partitioning a scatterplot: axial, modular, or polar. Axial partitioning is dividing the output using parallel lines, modular partitioning is partitioning using concentric circles, and polar

partitioning is partitioning using rays that emanate from a common origin (Groenen & Borg, 2003). Polar, and to a lesser extent modular, partitioning were used to define Figure 4 as polar partitioning is the most commonly used form by those defining firesetting typologies. Dividing the scatterplot of Figure 4 was also achieved through considering the similarities between the relationships presented in Figure 4 and types identified by Kocsis and Cooksey (2002), Icove and Estepp (1987) and Canter and Fritzon (1998). As such, the similarities between variable relationships found here in Figure 4 and those in the studies mentioned, were also used to inform the lines drawn to dissect the scatterplot into distinct firesetter groups. The divided areas (types) are given alphabetical letter names to support the move away from subjective motivation labels which is common in previous research. A straightforward approach of naming them 'A', 'B' and 'C' was deemed most appropriate and relevant for clarity of labelling.

The variables in the bottom right corner of Figure 4, represent those most likely to be carried out by Type 'A' firesetters. These variables include those identified as 'common' firesetting variables discussed above and along with four other variables likely to occur during fires set by Type 'A' firesetters. Type 'A' firesetters' other variables include targeting schools and educational buildings, businesses and commercial buildings, or hospitals and institutions. As already stated, in addition to targeting buildings they also targeted smaller items included in the 'Miscellaneous, Uninhabited or Derelict' variable. Type 'A' firesetters tended to set fires on weekdays, during the hours of daylight and mostly in the Summer months. Type 'A' firesetters demonstrates congruence with Canter and Fritzon's (1998) 'Expressive Object' and 'Instrumental Object' combined, as well as Icove and Estepp's (1987) 'Vandalism' and Kocsis and Cooksey's (2002) 'Wanton' firesetters. These firesetters all show similarities in that they all tend to target businesses, hospitals, miscellaneous items

(including bins, grassland etc.) and schools, and set fires predominantly during daylight, on weekdays and usually during the Spring/Summer[1]. 'Spring/Summer' here, refers to the months of March through to August, rather than seasonal changes. This provides for an easier comparison of the findings of this research to previous research, due to greater crossover of the seasonal and school holidays across studies (i.e., Christmas and Easter school holidays, Australia does not have an equivalent to the British Summer holidays). Since daylight hours are identified as a separate and independent variable, it can be considered independently from the season variables.

The top right corner of Figure 4, Type 'B' firesetters tended to set fires to residential property types and/or civic buildings such as leisure centres, places of worship, community halls etc., and set fires predominantly during Winter and/or Spring and over weekends. Type 'B' firesetters demonstrated some congruence with Kocsis and Cooksey's (2002) 'Thrill' firesetters, as those firesetters also set fires during the Winter season and during the weekend. The only overlap with Canter and Fritzon's (1998) firesetter types was through the targeting of residential property, linking it to their 'Expressive Person' type. There was also some congruity for Type 'B' firesetters and Icove and Estepp's (1987) 'Revenge' firesetters. 'Revenge' firesetters, like Type 'B' firesetters identified here are also likely to target residential properties and likely to set fires during the Winter months and during the weekends. The 'Revenge' firesetters also tended to set fires during the hours that are most likely to be dark; afternoon,

[1] Seasonal names for Kocsis and Cooksey's (2002) study were reversed due to their data being gathered in Australia such that, for the purposes of comparison within this research, their reported 'Winter' season, denoting 'June, July and August', is referred to as 'Summer' in this thesis. This is due to the seasons in Australia being different months to the corresponding seasons in England. It was considered more appropriate for the seasons reported by Kocsis and Cooksey (2002) to represent the same school and seasonal holidays as England rather than temperature and weather differences. Therefore, subsequent references to Kocsis and Cooksey's (2002) reported seasons will use the British season names: such that 'Winter' will now refer to the months of 'December, January and February', 'Spring' will refer to the months of 'March, April and May', 'Summer' to the months of 'June, July and August' and 'Autumn' to 'September, October and November'.

evening and early morning, however, this is not identified as either likely or unlikely in Type 'B' firesetters. Type 'B' firesetters were identified as only likely to set fire to one other variable, 'Civic' buildings. This is unlike Icove and Estepp (1987) whose research identified some other likely targets of the fires set by their 'Revenge' firesetters, such as cars and vehicles etc.

The third firesetter type identified in Figure 4 (top left) was Type 'C'; this group were most likely to set fire only to cars and other vehicles and were likely to do this in the Autumn and during hours of darkness. Due to Type 'C' having limited variables, comparisons to other typologies is challenging. The target of a car or vehicle meant it could be seen as representative of Canter and Fritzon's (1998) 'Instrumental Person', however, it seems that the link between 'Instrumental Person' and Type 'C' is tenuous because they have only one variable in common. For Type 'C', there is greater, although still limited, overlap with Kocsis and Cooksey's (2002) 'Anger' firesetter type because of the likelihood of weekend firesetting occurring during the Autumn months and the targeting of vehicles, which is present in both Type 'C' identified here and Kocsis and Cooksey's 'Anger' type. There was no crossover identified between Type 'C' and any of Icove and Estepp's (1987) firesetter types.

Thus, data collected from the 9,451 deliberate firesetting incidences attended by the WMFRS over the course of two years were analysed utilising MDS yielding meaningful results, discussed below.

Discussion

One of the aims of this research was to establish the 'typical' or most common firesetting behaviours through examining the frequency of firesetting crime scene

behaviours. Analysis of the data demonstrated a core of three frequently occurring firesetting crime scene behaviours which might be considered the most common behaviours to occur together. A second aim was to establish if there were distinct types of firesetters using only crime scene information gathered by Fire Officers from all deliberate fires set in WMFRS. Three types of firesetters were identified and labelled 'A', 'B' and 'C' for simplicity and to avoid any assumptions about motive. These three types were distinct with respect to what was set fire to and the time of day, day of the week, season, etc. The third and final aim was to compare fire setting types in this data set to those identified in Icove and Estepp's (1987), Canter and Fritzon's (1998) and Kocsis and Cooksey's (2002) firesetter typologies. There were some consistencies between some types of firesetter identified in this research and those identified in the three previous typologies.

Establishing the 'typical' or most common firesetting crime scene behaviours

First, considering the aim to establish 'typical' or most common firesetting behaviours, it was hypothesised that there would be 'common' firesetter behaviours easily identified which would represent a clear majority of firesetters. This has been borne out by the findings of this research. The results demonstrate there is a high frequency of two core behaviours ('Weekday' and 'Miscellaneous/Uninhabited/ Derelict') and a third behaviour ('Daylight'); all three are centrally located, on Figure 4. This close proximity indicates a high frequency and co-occurrence between these three variables. Therefore, this research identifies a 'common' firesetter as likely to set fires during daylight, on a weekday and target items such as derelict or uninhabited buildings, bins, grassland and similar. Common firesetting traits and behaviours identified by Canter and Fritzon (1998) include the variables: firesetting occurred less than a mile from the firesetter's home, the firesetter did not alert anyone after setting the

fire, the fire was set as opposed to a missile being thrown, the firesetter knew the owner of the fired property and the firesetting occurred on a weekday. Kocsis and Cooksey (2002) reported common firesetting traits and behaviours, which were: minor fires with a single point of origin at the entrance of a building, planning the firesetting, targeting a building that was linked to them in some way and occupied at the time (e.g. school or workplace), the firesetter had to enter the building in order to set the fire, committing a theft prior to the fire, the building had some form of security system for fires (e.g. a sprinkler system) and the firesetter had left physical evidence. As discussed in the introduction of this Chapter, it is considered that young people may represent the majority of firesetters (Tiffin & Cooper, 2006) and, therefore, it is possible that the most common firesetting crime scene variables identified in this research are representative of young people's firesetting. Tiffin and Cooper (2006) report serial, young firesetters have traits such as; being more likely to report emotional problems, being impulsive, having poor psychosocial functioning and a wide range of conduct problems. Thus, these traits may be more likely to be found within the Type 'A' firesetters as this is where the common firesetting variables are located.

When comparing the 'common' firesetter type identified in this research, to the 'common' firesetter in Kocsis and Cooksey's (2002) study, the only crime scene behaviour variable which appears in both, is that the fires are being set during weekdays. Kocsis and Cooksey's (2002) research was based on those convicted and sentenced through their criminal justice system and were focused on firesetters who set multiple fires. Therefore, it is possible that the firesetters in Kocsis and Cooksey's (2002) study are not truly representative of the wider cohort of firesetters and, because it remains unclear what common firesetters' traits may be due to the lack of research on a wide cohort of firesetters; comparison to confirm common traits is not possible. It is

likely that the common crime scene behaviours identified by Kocsis and Cooksey (2002) are found frequently in repeat firesetters whose fires are sufficiently large and problematic to result in detection and conviction. This is supported by the finding that the most common firesetting behaviours for their sample data included the target of the fire being an occupied building, there being a theft from the target building and that the firesetter left evidence at the crime scene. These traits make it more likely for the firesetter to be seen and identified as well as increasing the motivation and ease with which the Police may be able to obtain a conviction. These behaviours, therefore, make it more likely that the Police will obtain a successful conviction of this sub–group of firesetters and in turn made them more likely to be selected for inclusion in Kocsis and Cooksey's (2002) research. One advantage of the current study, therefore, is that it likely demonstrates a more robust representation of common firesetters' crime scene behaviour than previous research (e.g., Kocsis & Cooksey, 2002). This is supported by a high level of small and relatively low level fires (Miscellaneous, Uninhabited and Derelict buildings and items) being set by the 'common' firesetters, which is in keeping with Tiffin and Cooper's (2006) findings of young people being the most likely perpetrators of deliberate firesetting. The findings are also supported by Canter and Fritzon's (1998) common firesetting behaviour of weekday fires.

Establishing if there are distinct types of firesetting crime scene behaviours

Identifying different firesetting types utilising firesetting crime scene behaviours was another aim of this research; and has been achieved to some extent. Using previous firesetter typology research (Canter & Fritzon; 1998; Icove & Estepp, 1987; Kocsis & Cooksey, 2002) to inform the approach in interpretation, the MDS analysis demonstrated the division of the firesetting behaviour into three distinct firesetting types, utilising firesetting crime scene behaviour only. Next, each type will be

identified in turn and compared with the types developed by Canter and Fritzon (1998), Icove and Estepp (1987) and Kocsis and Cooksey (2002). They will be considered in terms of any overlapping variables between the types developed in this research and those identified in the previous research highlighted above. The types developed in this research will also be discussed with respect to additional, non–motivation focused, variables analysed in previous research that were not examined in this research, to further develop understanding of the types being proposed.

Comparing this data set's firesetter types with types of firesetters identified by Icove and Estepp (1987), Canter and Fritzon (1998) and Kocsis and Cooksey (2002)

Type 'A'

There are clear crossovers between Type 'A' firesetters identified in this WMFRS data and Canter and Fritzon's (1998) 'Object' type, Icove and Estepp's (1987) 'Vandalism' type, and Kocsis and Cooksey's (2002) 'Wanton' type. Firesetters from all these types were associated to setting fire to schools or educational buildings, business/commercial buildings and hospital/health related buildings. Type 'A' firesetters were also likely to set fires to targets other than buildings such as; bins, grassland, bus shelters, sheds, derelict constructions etc. This is the widest range of targets of all the three firesetting types identified in this research. However, despite this seemingly generic sweep of target buildings, there is consistency in that the firesetting types identified above ('Object', 'Vandalism' and 'Wanton'), were far less likely to set fires to residential properties, civic or institutional buildings such as government buildings, or cars and vehicles of any type. Moreover, this cohort of firesetters, 'Wanton', 'Vandalism' and 'Object', are also setting fires predominantly on weekdays

and during daylight hours, demonstrating further consistency with the Type 'A' firesetters identified in the current dataset.

Kocsis and Cooksey (2002) drew parallels between their 'Wanton' firesetters, Canter and Fritzon's (1998) 'Instrumental Object' firesetters and with "vandalism–motivated arson" (p.649). This lends validation to a connection between the firesetter types discussed in connection to Type 'A' and 'Wanton', 'Instrumental Object' and 'Vandalism'. Davis and Bennet (2016) also commented on the connection between these three types. Icove and Estepp's (1987) 'Vandalism' firesetter was identified as juvenile (96%) and provides useful comparison with Canter and Fritzon's (1998) 'Instrumental Object' firesetters, also described as likely to be young. 'Wanton' and 'Vandalism' types also both identified their firesetters as having previous criminal convictions. 'Vandalism' and 'Object' firesetters were both identified as living near the target. 'Object' firesetters as a group were identified by Canter and Fritzon (1998) as likely to be repetitive firesetters and to have offended with another person, gaining entry to a building for the purposes of theft. These personal details could potentially be utilised to inform a more comprehensive understanding of Type 'A' firesetters. Specifically, these consistencies suggest Type 'A' firesetters could be: young, serial firesetters, setting relatively unambitious fires in terms of size, as part of growing up, often as part of a group and possibly have had previous and/or concurrent criminal behaviour, as well as living close to the target (Canter & Almond, 2002; Thompson, 2002; Tiffin & Cooper, 2006). There also appears to be some overlap with the 'common' firesetting behaviour identified in this research.

Type 'B'

Type 'B' firesetters identified in this research demonstrated less comprehensive and conclusive crossover with previous firesetter types in previous research than did Type 'A'. Type B were most likely to set fires to residential properties over a weekend and during the winter months. There is a tenuous connection in this respect with Canter and Fritzon's (1998) 'Expressive Person' firesetters who set fires to residential properties. However, 'Residential' was the only variable within Canter and Fritzon's (1998) 'Expressive Person' firesetter type that was consistent with Type 'B' firesetters and therefore strong conclusions cannot be drawn. All three typologies (Canter & Fritzon, 1998; Kocsis & Cooksey, 2002; Icove & Estepp, 1987) differentiated between firesetters who set fire to cars and vehicles and those that targeted properties, lending support to this separation between Type 'B' and Type 'C' firesetters in this research. There is some comparison to be made between Type 'B' firesetters and Icove and Estepp's (1987) 'Revenge' firesetters. These firesetters were identified as likely to set fire during Autumn and Winter months during weekends and were likely to set fire to residential properties. These variables demonstrate considerable cross over between 'Revenge' firesetter types and Type 'B' firesetters. There were not enough similarities between any of Kocsis and Cooksey's (2002) firesetter types and Type 'B' firesetter identified in this research to comment upon.

Linking Type 'B' firesetters with personality or socio–economic traits of other established firesetter types is difficult. For instance, Canter and Fritzon's (1998) 'Expressive Person' and Type 'B' firesetters have limited crossover with respect to crime scene behaviour variables, making comparison restricted. Additionally, beyond the personal nature of the motivation and the target likely to be a residential property, nearly all other variables in the 'Expressive Person' type relate to suicidal behaviour.

For instance, these firesetters were reported as likely to have written a suicide note, set fire to themselves, or deliberately threatened their own life (Canter & Fritzon, 1998). The only variables unrelated to suicidal behaviour were that they were likely to have set fire to their own home or lived in the locality the fire was set in (Canter & Fritzon, 1998). Thus, Canter and Fritzon's (1998) variables relating to the 'Expressive Person' type add only a very narrow description to the likely personality or descriptive traits that could be of use to fire investigation. Compared to Canter and Fritzon (1998), Icove and Estepp (1987) have more details regarding their 'Revenge' firesetter type. They report these firesetters are mostly adults who are likely to have taken drugs and/or alcohol prior to setting the fire. They are also likely to have had prior arrests and to have acted alone. This lends some support to these traits possibly being identifiable in the Type 'B' firesetters identified in the WMFRS data.

Type 'C'

Type 'C' firesetters were based only on three variables ('Car Vehicle', 'Night time' and 'Autumn'). As such, comparison is inevitably limited and conclusions drawn will necessarily be tentative. Additionally, due to Canter and Fritzon (1998) not including season variables in their study, there is only the possibility of two variables to compare with their typologies. There is only one variable shared between Type 'C' firesetters and Canter and Fritzon's (1998) 'Instrumental Person' firesetter type; the targets being cars or vehicles. Icove and Estepp's (1987) firesetter type 'Crime Concealment' demonstrates some similarities with Type 'C'. This type was setting fires at night time both during Summer and Autumn months and have the highest proportion of cars or vehicles as likely targets than any of Icove and Estepp's (1987) other types. Kocsis and Cooksey's (2002) 'Anger' firesetter type has some similarity with Type 'C' with both types setting fire to cars or vehicles during the Autumn. Kocsis and Cooksey

(2002) also identified similarities between their 'Anger' type and Canter and Fritzon's (1998) 'Instrumental Person'. This adds some validity to the proposed connection between, Kocsis and Cooksey's (2002) 'Anger' firesetters, Canter and Fritzon's (1998) 'Instrumental Person' firesetters and the Type 'C' firesetters, found in this research.

However, when the variables relating to motives and emotional responses/interactions with the victim are excluded from the Canter and Fritzon's (1998) and Kocsis and Cooksey's (2002) firesetting types discussed above, there seems to be limited overlap between them and Type 'C' firesetters. For example, variables identified with 'Instrumental Person' firesetters in Canter and Fritzon's (1998) typology focus mainly on personal interactions the firesetter had with the victim *prior* to the firesetting incident, such as 'Threats', 'Argument' and 'Victim known' etc;. Once these variables are excluded due to not being crime scene behaviour variables, this leaves only variables 'Accelerant' and 'Car', reducing the number of variables available for comparison to Type 'C' firesetter. Similarly, 'Anger' firesetters in Kocsis and Cooksey's (2002) typology are reported as being motivated by the emotion anger. However, once this is excluded and despite the authors gathering a dearth of information including socio–economic status, physical and personality traits; none of these are identified with their 'Anger' firesetter. This provides limited variables with which to compare Type 'C' firesetters with Kocsis and Cooksey's (2002) 'Anger' firesetters and Canter and Fritzon's (1998) 'Instrumental Person' firesetters.

Linking Type 'C' firesetters' crime scene behaviour variables to personality or behavioural traits might be possible in respect to Icove and Estepp's (1987) 'Crime Concealment' firesetters. Icove and Estepp (1987) identify a number of additional factors in their 'Crime Concealment' firesetters that may be attributed to Type 'C'

firesetters. For example, they report 'Crime Concealment' firesetters are likely to be single, adult males who are setting fires to conceal another offence (Icove & Estepp, 1987). They are also likely to have prior arrests for offending and are likely to live more than a mile away from the target. This could fit with Type 'C' in respect that the cars could be are set on fire in order to destroy evidence having been stolen and used to joyride or in the commission of another offence, and then abandoned. However, this is again moving towards defining motivation, which could be subjective or mistaken. Focusing on motivation creates issues such as inviting subjective speculation and/or reliance on a firesetter's motivations being extrapolated from their behaviours, that only one motivation is present and that this is consistently expressed. Type 'C' firesetters could be similar to 'Crime Concealment' in that they may have a number of other convictions for similar and/or other offences. In this way Type 'C' firesetters could be adult males setting fire to vehicles as part of their offending repertoire. This hypothesis is supported by the Office of the Deputy Prime Minister (2004) which reported that in the UK, 79% of deliberate car fires are set to cover criminal act or as an act of vandalism.

It must be considered, however, that the types from previous typologies (e.g. 'Instrumental Person', 'Anger' and 'Crime Concealment') that seem consistent with Type 'C' firesetters in the current research, are not consistent with each other. There are descriptive elements that are at odds between Kocsis and Cooksey's (2002) 'Anger' and Icove and Estepp's (2987) 'Crime Concealment' firesestters, such as 'Anger' firesetters having financial security but 'Crime Concealment' firesetters being on a 'marginal income'. Some comparison may be drawn from Canter and Fritzon's (1998) description of the 'Instrumental Person' threatening violence towards the victim prior to the firesetting and Kocsis and Cooksey's (1987) 'Anger' firesetter setting fires to inflict

personal harm on a known victim. However, this consistency is reliant upon accurate attribution of motives and emotions to firesetters, which this research is attempting to move away from.

Implications of findings

The findings add to an understanding of firesetter typologies by attempting to include as many deliberate firesetters in the analysis as possible. Thus, these findings attempt to provide an overview of all firesetters, within a particular geographical location, and some of the, objectively recorded, crime scene behaviours they demonstrated. The research attempts to reduce as much bias from the selection of firesetters under study and subjective judgements about their motivations. Despite a reliance on crime scene behaviours, the results demonstrate there are some useful consistencies with previously identified typologies. Therefore, these findings also add validity to some of the typologies established in previous research.

The findings also contribute to consolidating an understanding of common firesetting crime scene behaviour, because un–apprehended firesetters are under–represented in previous research (Doley, 2003a; Doley, 2003b). Since only 7% of all firesetting leads to a criminal conviction and previous research has been based on those convicted; common firesetting traits identified in previous research are likely to have only represented the common firesetting traits of this small cohort of apprehended firesetters. Previously, research has focused on exploring the common crime scene behaviours and traits of a specific sub–group such as juveniles, those with mental health disorders or those with learning difficulties. As a result, there has not been research utilising an inclusive representative cohort of firesetters and, therefore, their crime scene behaviours. Thus, attempts to compare different firesetting typologies and/or trying to

develop consistencies between firesetter types is complex and presents a number of challenges. This is because the sub–groups of firesetter typologies selected for comparison may have different traits and behaviours that are more common to the sub–group they belong to and may not present a clear picture of all firesetter crime scene behaviours, thus present atypical outcomes. This means there may be crime scene behaviours or other traits identified that are common to those convicted but are not necessarily representative of all firesetters. For example, it may be that apprehended firesetters have a greater propensity to demonstrate particular crime scene behaviours that lend themselves to an increased likelihood of being caught and convicted, such as staying around to watch the fire service attend the fire or making specific threats to a named individual prior to setting fire to their property. However, these crime scene behaviours may be less common amongst un–apprehended firesetters, leading to possible biased belief that these behaviours are more common to firesetters than tin reality. Although defining and exploring the traits and behaviours of these sub–groups will aid and support treatment, this may be to the detriment of investigative needs.

It is possible that reliance on firesetters' inferred motivations could be contributing to a lack of consistency across different typologies developed by previous research (Doley, 2003b). Motivation is a seemingly subjective basis for the identification of firesetter types and means the types identified in one study are more at risk of not being replicable across different studies and are, therefore, less likely to be robust. Using crime scene information to identify specific behaviours which are likely to occur and be recorded accurately, such as times, days and/or seasons, allows for more standardised methods of developing firesetting types (Gannon, 2016). The use of objective factors, such as the crime scene behaviours used in this study, will likely lead to more objectively developed typologies, leading in turn to a greater ability to compare

firesetter types across research studies. Through removing the bias of subjective variables such as 'foreign accent', 'unattractive' or 'sexually aroused by the fire', firesetters can be compared in a consistent, objective and reliable way.

This research used only crime scene behaviours. As such, the findings of this research have identified the behaviours of firesetters, without the subjectivity of motivations and emotion led elements that may or may not impact directly on firesetting crime scene behaviours. Gannon et al. (2012) acknowledged the M–TAFF theory does not explain why firesetters choose what to set fire to or the immediate precipitating triggers in terms of location and target. This suggests a disconnect between our understanding of an individual's propensity to set fires and what they are likely to set fire to and when. Therefore, robust firesetter types that reflect crime scene behaviours are a necessary part of firesetting research to improve our understanding. This research has attempted to develop a robust typology, based on crime scene behaviours that is replicable in future research and demonstrates some promising findings.

A possible benefit of a more robust typology based on crime scene behaviours, is that services will be better able to focus their time and resources on appropriate and relevant risk management and interventions. Understanding what types of fires certain firesetters are likely to be set and when they are likely to set them, will support fire services in ensuring they are staffed and available at 'peak' times. Being able to anticipate likely target 'hot spots' can support police in ensuring officers are able to focus their resources and staffing appropriately. This wider picture could also be used to better support schools in ensuring relevant interventions and programmes are run at appropriate times of year, and for school/college age groups, to address those most at risk of setting fires. Interventions can ensure information is provided appropriately to

better protect these individuals at risk of firesetting, as well as the wider community from the effects firesetting (Canter & Almond, 2002). Finally, a more comprehensive picture will allow those tasked with managing firesetters to have a clearer idea of the different issues that may be relevant to firesetters and could form part of their community or custodial sentencing. For example, sentencing a firesetter who has set fire to an abandoned car to help clear up as part of improving their understanding of the impact their firesetting has on the community, as well as to serve as 'pay back' to the community.

Limitations

The data is based upon the WMFRS and there may be differences in the way different Fire Officers record data as well as differences between the way WMFRS and other FRS's record data. These differences could impact on the accuracy of the data used and the generalisability of the results. For example, the decision whether to record a fire as accidental can be influenced by the Fire Officer's commitment to fill in a number of follow up questions on the recording form (R. Roberts, personal communication, February 8th, 2019). This suggests there may be a proportion of fires, recorded as deliberate, that were accidental. For the WMFRS, up to 20% of forms can be completed incorrectly in this respect and are returned for amending, however, these amendments are not necessarily updated on the computer recording system (R. Roberts, personal communication, February 8th, 2019). This could lead to a proportion of data being inaccurately coded, which may have altered the interpretation of the data.

Moreover, another difficulty with using data from un–apprehended firesetters is there is no way of knowing if several firesetters were involved in one firesetting incident and/or if multiple firesetting incidents are caused by one particular firesetter.

First, considering multiple perpetrator fires, differences in personal preferences, choices and dynamics within groups of offenders has been shown to impact upon behaviour during offences such as rapes and burglaries (Burrell, Bull, Bond, & Herrington, 2015; Hauffe & Porter, 2009). Therefore, it is possible there may be similar influences on groups of firesetters, for example, how a fire is set, what the choice of target is, as well as when the fire is set. If a group of firesetters have set multiple fires, this could impact on the frequency of particular variables, by making it seem that certain crime scene behaviours are more or less common and/or connected due to a group having a greater or lesser propensity for that behaviour. This information is not available in the current dataset. Second, considering firesetters who set multiple fires, it could also be argued that if one firesetter committed a very high number of offences over a long period of time, this could affect results, because the MDS results could highlight an individual firesetter's crime scene behaviours, rather than identifying crime scene behaviours common to a type of firesetter. This could, in turn, lead to erroneous analysis and conclusions due to the data not reflecting all firesetting incidences proportionately because the frequency of variables are misrepresented. Previous research suggests that the MDS analysis results are still viable and interpretable with the inclusion of multiple offences by the same perpetrator (Häkkänen, Puolakka, & Santtila 2004; Sturidsson et al., 2006). Additionally, there were over 9,500 incidents in the current dataset. Therefore, it is likely that the impact repeat/serial firetters could make on the general patterns in the data, would be very limited.

Finally, the study is also limited by the variables that were available from WMFRS through the freedom of information act. Greater detail of crime scene behaviours would allow for a more comprehensive overview and categorisation of firesetting crime scene behaviours. Details such as: specific locations, what was used to

set the fire, whether individuals or groups were seen fleeing from the site of the fire, as well as whether the target was readily open to viewing from the public, all would have likely been useful in this regard. However, despite requesting additional data through several channels (including the Police Force, through researchers' partnership with the Police Force and the WMFRS, academic researchers liaising with the FRS and through the freedom of information act), it was not possible, unfortunately, to gain more information regarding crime scene behaviours or specific, usable geographical location data on this occasion.

Additionally, it was not possible to utilise the crime scene behaviour variable, from the WMFRS dataset, as to whether an accelerant was used. Since this was only recorded by the fire service for primary fires, and not for secondary fires, inclusion of accelerant was deemed likely to bias the outcome of the MDS analysis. As only the most serious and large fires are recorded as primary (and represent a smaller percentage of fires attended), it would not indicate whether accelerants were used on the more frequent, smaller fires. The use of accelerant to set fires could contribute to our understanding as to whether the firesetter was likely to have pre–planned the firesetting, adding to our understanding of the behaviours leading up to the firesetting as well as the crime scene behaviour itself (Canter & Fritzon, 1998; Kocsis & Cooksey, 2002).

Future directions

Future research would benefit from closer working with the FRS's to obtain more detailed data on each firesetting incident. As noted above, the crime scene behaviour variables used in this research were limited by the data available from WMFRS, which may constrain the generalisability of the findings. It would be interesting for future research to consider possible incidents of antisocial behaviour

and/or vandalism in the geographical location prior and subsequent to firesetting incidents. There is anecdotal evidence to suggest this may co–occur frequently (R. Roberts, personal communication, February 8th, 2019), but it would be interesting to study this empirically. It would also be helpful, given the identification of setting fires to cars and vehicles as a distinct firesetting type, to develop greater understanding of this firesetter type through identifying the status of the vehicles being set fire to. For example, whether they had been stolen, abandoned, used in the commission of a crime etc. This could help direct FRS and Police services in focusing on particular geographical hotspots for particular car crimes, such as cars dumped after joyriding, ensuring vehicles are removed promptly before being set fire to (Canter & Almond, 2002).

Finally, research would also benefit from direct input from investigators, both FRS and Police, to direct research on firesetting towards answering questions that are related to their investigative needs (Canter & Almond, 2002; Davis & Bennett, 2016). Ensuring research is directed towards areas that would benefit investigators would support the effective and appropriate focus for developing understanding of firesetters' crime scene behaviours and provide practical value to research. For example, research directed at crime linkage, geographical profiling and investigative interview strategies would all be areas that could benefit from receiving direction from those investigating firesetting (Davis & Bennett, 2016). This would support investigation processes guiding better use of resources and have the potential to improve conviction rates (Brogan, 2014). It is important to note that these studies should also be guided by, and help to develop, theory to ensure a psychologically informed evidence base for practice (Gannon, 2016).

Conclusion

It has been possible to use crime scene behaviours of firesetters to identify three different types of firesetters. These findings are based on all firesetting over the course of two years within the remit of the WMFRS, which provides a reasonably robust set of data on which to conduct analysis. Whilst it is acknowledged there are limitations to the data, overall it provides a comprehensive representation of the most common firesetting crime scene behaviours. The author has also demonstrated overlap with previously identified typologies lending a robustness to these findings. This research demonstrates the value in focusing on crime scene behaviours that are either present or not and can therefore provide an overview of firesetters that are likely to behave in similar ways for investigation purposes. These findings, along with future research in this area, could prove useful in supporting investigators when attempting to identify possible serial firesetters through similarities in crime scene behaviours. These findings, and future research, could also help identify which firesetting crime scene behaviour variables might be significant in individual firesetters and those that are common to a wide variety of firesetter types.

Chapter 4

Review of firesetter assessments and a critique of The Fire Proclivities Scale

Abstract

This review and critique begins by exploring the importance of better understanding of un–apprehended firesetters and briefly reviews the contributions of previous research to date. The role of developing a firesetting assessment is reviewed and recently developed assessments explored, including the Fire Interest Rating Scale (FIRS), Fire Attitude Scale (FAS), Four Factor Fire Scales (FFFS), Fire Setting Scale (FSS) and Fire Setting Assessment Schedule (FSAS) . This review and critique then considers the psychometric assessment, The Fire Proclivities Scale (FPS), developed by Gannon and Barrowcliffe (2012). The design of the FPS is based on the Rape Proclivity Scale (RPS) developed by Bohner et al. (1998) along with Gannon and Barrowcliffe's (2012) knowledge of firesetting. Through the FPS, Gannon and Barrowcliffe (2012) attempt to identify fire setting proclivity in un–apprehended firesetters. The critique evaluates Gannon and Barrowcliffe's (2012) FPS in terms of its scientific properties, its applicability to detecting propensity to set fires in un–apprehended firesetters and its risk–reduction uses. The FPS is demonstrated to have good reliability and validity and it is concluded that it would benefit from further use and validation amongst a wider population.

Introduction

Most research in the area of deliberate firesetting has focused on apprehended firesetters identified for clinical research from prison or psychiatric communities. However, since a perpetrator is detected in only 7% of deliberately set fires, it is highly likely that a large proportion of these fires are perpetrated by un–apprehended fire setters who are not part of the prison or psychiatric populations (Department for Communities and Local Government, 2018). Therefore, it can be surmised there are un–apprehended fire setters living within the community about whom very little is known and who are setting a, possibly significant, proportion of deliberately set fires (Canter & Almond, 2002). Chapter three made some attempt to address this by examining crime scene behaviours of apprehended and un–apprehended firesetters. Yet those on whom most of the previous research has been based may only provide part of the picture when considering fire setting behaviours, propensities, traits and risk factors (Canter & Almond, 2002; Doley, 2003a; Gannon & Pina, 2016). To address firesetting risk within the community, further research on un–apprehended firesetters can develop our understanding of this population and ensure risk reduction efforts are appropriate, focused and effective.

Understanding firesetters has predominantly focused on personality traits and socio–economic factors. For example, firesetters report difficulty in expressing their emotions and experience anxiety (Tyler & Gannon, 2012), are more likely to have experienced abuse during childhood (Barrowcliffe & Gannon, 2015), are younger (Gannon & Pina, 2010), and have lower IQ levels (Rice & Harris, 1991) when compared to non–firesetting offenders. Lindberg et al. (2005) highlighted antisocial personality disorder as the most common personality disorder amongst recidivist firesetters. Antisociality and fire interest in firesetters is further supported as having

predictive power for recidivism by MacKay et al. (2006). However, despite these differences there are many similarities to be found between firesetting and non–firesetting offenders (Ducat, McEwan, & Ogloff, 2013). Gannon and Pina (2012) report similarities in low economic status, poor education and unskilled employment. Barrowcliffe and Gannon (2015) conclude there are few notable differences between firesetters and non–firesetters. This demonstrates the difficulties in relying on traits and socio–economic factors alone to differentiate between general offender populations and firesetters. Not having distinct traits that consistently identify firesetters, makes addressing risk of recidivism more challenging. This lack of clear understanding of those who deliberately set fires has clear implications for appropriately directed educational and preventative programmes or interventions and therefore, the reduction of risk of recidivism (Doley, 2003a).

Typologies seek to incorporate a wider range of variables including personality traits, crime scene behaviours, background, upbringing and motivation (Canter & Fritzon, 1998; Harris & Rice 1996; Icove and Estepp, 1987; Kocsis & Cooksey, 2002). Analysis of variables, as discussed in Chapter three, have produced typologies that have historically incorporated variables covering a wide range of topics (such as physical characteristics, behaviour during firesetting, socio–economic traits, background and education etc.). However, as discussed in Chapter two, it is clear assumed firesetting–motivation has continued to play a large part in how firesetters are categorised. Moreover, typologies have typically been developed based on apprehended firesetters and therefore this continues to paint a limited picture of all — apprehended and un–apprehended — firesetters.

In order to address this gap in knowledge regarding un–apprehend firesetters, Gannon and Barrowcliffe (2012) developed the FPS. Gannon and Barrowcliffe (2012) applied the development of the Rape Proclivities Scale (RPS) to inform the structure of FPS. The RPS is based upon neutralisation theory which explains "deviant activity can be predicted not by deviant attitudes and subjective norms, but rather by the extent to which a potential actor is able to neutralise the individual and/or social perception of a norm violation" (Bohner et al., 1998, p.484). Fritsche (2005) reports that a central assertion of the neutralisation theory is the belief that neutralisations are necessary for, and indeed predict deviant behaviour. He further reported that neutralisations which served to allow previous deviant behaviour are also believed to influence subsequent deviant behaviours, such that future deviation from the norm is more likely (Fritsche, 2005). It should be noted, however, that neutralisation theory is not without its limitations. For example, the ability an individual has to apply neutralisation tactics is partly dependent on the type and nature of the deviant behaviour; the theory is also most applicable to adolescents (Minor, 1981).

Despite these potential limitations of neutralisation theory, the RPS has nevertheless produced positive results. For example, Bohner et al.'s (1998) research showed convicted rapists score more highly on the RPS when compared to a general sample and concluded that their research "supports the notion that there is a causal influence of rape–related attitudes on behavioural intentions" (p.266). They established the possibility of three core areas of propensity to rape: participants enjoyment of rape scenarios, their general arousal to rape scenarios and their reported behavioural inclination to engage in similar behaviour. Their findings showed a significant correlation with rape proclivity as measured by RPS for two of their indices, behavioural inclination and enjoyment. Given the encouraging results of the validity of

the RPS, Gannon and Barrowcliffe (2012) utilised the RPS as a framework, alongside their knowledge of firesetting literature, to support the development of the FPS.

Firesetting assessments

There are limited options when considering assessments relating to firesetting, specifically an individual's propensity to set a fire. The majority of assessments are designed to address firesetting in children and adolescents (MacKay, Feldberg, Ward, & Marton, 2012). Of those specifically aimed at adult populations is the Fire Interest Rating Scale (FIRS) developed by Murphy and Clare (1996), who questioned both firesetters and non–firesetters' with learning difficulties about their feelings in relation to setting fires. The authors provided fourteen descriptions of firesetting scenarios and participants were asked to rate how they would feel in each situation on a Likert scale (1–7). They found that firesetters scored higher than non–firesetters (Murphy & Clare, 1996); however, due to the size and nature of the sample, which may have given more socially desirable responses, it is difficult to know the applicability of this assessment to the general population. Additionally, Murphy and Clare (1996) did not publish data regarding the reliability and validity of their assessment. Reliability and validity have been addressed more recently, though, as commented on below in the discussion of the Four Factor Fire Scales (FFFS).

Another adult assessment tool is the Fire Attitude Scale (FAS) developed by Muckley (1997) to identify attitudes and behaviour toward the use of fire. The FAS presents 20 statements which participants respond to utilising a Likert scale (1–5). It was developed with both adults and children as participants and covered fire–related antisocial behaviour, as well as fire interest. Unfortunately, as with the FIRS, there was

no validity or reliability data published. This has also been addressed more recently and is commented on during the discussion of the Four Factor Fire Scales (FFFS) below.

The FFFS incorporated the FIRS (Murphy & Clare, 1996), FAS (Muckley, 1997) and the unpublished Interest in Fire Questionnaire (IFQ; Gannon, Ó Ciardha, & Barnoux, 2011) to create an assessment that incorporated the variables and traits of all the individual assessments (Ó Ciardha, Tyler, & Gannon, 2015). The IFQ is a 10–item self–report scale looking at fire–supportive attitudes (Ó Ciardha, Tyler, & Gannon, 2015). The 3 scales (FIRS, FAS and IFQ) were presented as one assessment to female and male firesetters and non–firesetters recruited from adult and young–offender prisons, as well as secure mental health settings (N = 565). Ó Ciardha, Barnoux, Alleyne, Tyler, Mozova, & Gannon, (2015) report that factor analysis conducted on these scales highlighted four factors, identified over the three scales, which were statistically significant in their discrimination of firesetters from non–firesetters. The factors were: identification with fire ($p = .03$), serious fire interest ($p < .001$), fire safety ($p < .001$), firesetting as normal ($p < .001$), as well as the total score of the factor items ($p < .001$). Two of these factors also showed good internal consistency; identification with fire ($\alpha = .85$)[1] and serious fire interest ($\alpha = .87$). This means both the identification with fire and serious fire interest scales are testing the same general construct, discussed in greater detail below. The FFFS demonstrates an opportunity for likelihood of future firesetting to be established, based upon constructs which differentiate between firesetting offenders and non–firesetting offenders.

[1]Cronbach's α uses pairwise correlations between items which produces a score up to 1 where the higher the score the better the internal consistency. Generally, anything over 0.8 is considered to demonstrate good internal consistency, however, scores over 0.75 are also deemed acceptable. Scores below this are considered 'poor' (Bonnett & Wright, 2015; Kline, 2000)

Another assessment is the Fire Setting Scale (FSS) (Gannon & Barrowcliffe, 2012). The FSS was completed by the same participants alongside the FPS, the focus of this review and critique. The FSS examines the feelings reported by firesetters, as well as their antisocial attitude and behaviours. The FSS scale consists of 20 items empirically related to detecting both adult and adolescent firesetters and is comprised of two 10–item subscales that measure antisocial behaviour and fire interest. The FFS demonstrated both good internal consistencies (α = .86) and test–retest reliability (Pearson's r = 86)[1]. Good test-retest reliability means the same test can be administered multiple times to the same individual and yield consistent results, explored in greater depth below. Additionally, the authors found a statistically significant difference between firesetters and non–firesetters using the combined scores of the FSS. Again, like the FFFS, this demonstrates an opportunity for likelihood of future firesetting to be established, based upon constructs which differentiate between firesetting offenders and non–firesetting offenders.

Finally, before turning to the focus of this Chapter, a critique of the FPS, it is important to acknowledge one final assessment, the Fire Setting Assessment Schedule (FSAS) developed by Murphey and Clare (1996). The schedule consists of 32 items which ask about thoughts and feelings prior to and immediately after setting fires. The FSAS provides insight into understanding the possible motivations which could be linked to firesetting risk, however, it does not look at the likelihood of the individual to set fires in the future. Currently, due to the lack of validation it is yet to be considered a reliable assessment tool in this respect, but further research may be warranted to better understand its potential role in risk assessment.

[1] Pearson's r requires a minimum of r = .80 to confirm the test–retest reliability of an assessment satisfactorily (Kline, 2000).

Overview of the Fire Proclivities Scale

Purpose of the Fire Proclivities Scale

The FPS was developed to identify un–apprehended firesetters in the general community through their firesetting propensity (Gannon & Barrowcliffe, 2012). Being able to classify individuals into those that are likely and those who are unlikely to deliberately set a fire has several benefits. For example, it will allow for the identification of those in the community who may be prone to set fires and would therefore benefit from firesetting prevention interventions. The authors also anticipate that it could identify those in a secure setting (whether or not incarcerated for firesetting offences), who would benefit from addressing their firesetting propensity. Finally, the authors report that it could be utilised to measure changes in propensity to set fires of those who have engaged in a firesetting interventions, thus clearly establishing whether there has been a reduction of risk.

The FPS consists of six hypothetical scenarios of firesetting (appendix 7) about which four questions are asked on a Likert scale (1–5). Participants are asked to imagine themselves in the situation described and state to what extent they would be fascinated by the fire, *not at all fascinated* (1) to *very strongly fascinated* (5). The second question asks the extent to which they could see themselves doing the same thing from: *would definitely not have done the same* (1) to *would definitely have done the same* (5). Participants are also asked to rate how much they would have enjoyed watching the fire from: *would not enjoy it at all* (1) to *would greatly enjoy it* (5). Finally, they are asked to rate how much they would have enjoyed the reaction of someone seeing them light the fire on a scale from: *would not enjoy it at all* (1) to *would greatly enjoy it* (5).

No published manual exists for the FPS, however the questions, scenarios as well as administering and scoring information are available (see Gannon & Barrowcliffe, 2012). Gannon and Barrowcliffe (2012) describe how the tool was developed and validated, and subsequently two further peer reviewed publications by the research team have investigated the reliability and validity of the FPS (Barrowcliffe & Gannon, 2015, 2016).

Reviewing the assessment

Scientific development of the Fire Proclivities Scale

The FPS scenarios developed by the authors, reflect a selection of different firesetting scenarios. Three studies have been conducted to test the psychometric properties of the FPS. First, Gannon and Barrowcliffe (2012) collected data from 158 participants (109 females, 49 males) who were invited to attend, at two separate times, to complete the questionnaires. Of those 158 participants who attended Time 1, 150 returned for Time 2. Participants were recruited through snowballing techniques alongside promotion on university and community forums. Participants ranged in age from 18 to 70 years old (M = 32 years) and it was recognised that the majority of attendees were from the UK university student population. The responses from Time 1 and Time 2 were compared to assess validity and reliability, utilising statistical analysis, detailed below. Time 1 responses alone were utilised to consider psychometric properties of the tool. The participants completed three questionnaires in total: the FPS, the Fire Setting Scale (FSS) and an impression management scale (Balanced Inventory of Desirable Responding – BIDR). Alongside this they also provided demographic information and answered a detailed firesetting disclosure section. The firesetting disclosure section identified un–apprehended firesetters in the community through asking about deliberate fires set since they were 10 years old. The disclosure section

also asked about their reasons for setting fires, their knowledge of firesetting and where the fires were set; and their response to the fires they deliberately set.

Second and third studies were completed by Barrowcliffe and Gannon in 2015 and 2016 to further test the FPS with respect to its ability to distinguish between un–apprehended firesetters and non–firesetters in the community. They sought to further confirm the validity and reliability of the FPS alongside the FSS, BIDR, the FAS and an Identification with Fire Scale (IFS). Barrowcliffe and Gannon (2015) invited participants from 10% of Thanet's (Kent) population, of whom 133 fully completed the survey (79 female, 78 male). Barrowcliffe and Gannon (2015) report results relating to internal validity but did not conduct test–retest reliability measures for this study. Barrowcliffe and Gannon (2016) recruited 225 (188 females, 37 males) participants through social media and snowballing techniques.

There are no further published reviews or applications of the FPS and therefore the following discussion and review of scientific properties focuses on the peer reviewed papers cited above.

Characteristics of the Fire Proclivities Scale

Scenarios

The FPS development was based on the RPS, where participants read descriptions of different rape scenarios and are asked to answer questions using a Likert scale response (Bohner et al., 1998). The six scenarios depicting deliberate firesetting developed by Gannon and Barrowcliffe (2012) were created utilising the RPS as a framework and the authors extensive experience in firesetting. The different scenarios represent firesetting as both an individual behaviour and as a group activity. The

scenarios also vary regarding what was burnt, cover possible emotional motivation of the firesetter(s), as well as describing a range of fires with respect to size and level of control (Gannon & Barrowcliffe, 2012). There is no further information on how the decision was made regarding the order in which the different scenarios were presented. Accessibility in terms of readability does not seem to have been considered by Gannon and Barrowcliffe (2012). However, the Flesch–Kincaid readability (identifies a text's readability in English and is available in Word) conducted by the current author identifies the scenarios as overall "fairly easy to read" and commensurate with a reading age of around 12 years old. This suggests the scenarios are likely to be readily accessible and understood by participants. Details on how the scenarios were chosen and how representative they are of un–apprehended firesetter's thoughts, feelings and behaviours is also unclear. Gannon and Barrowcliffe (2012) did not report that scenarios had been vetted by an expert panel or that they were pre–tested in order to judge suitability. Hughes and Huby (2004) highlight that to ensure scenarios used in research have internal validity, they should be informed by previous research and existing literature, as well as being based on the authors' personal and professional experience. This is in keeping with Gannon and Barrowcliffe's (2012) reported approach. However, there continues to be concerns raised regarding the lack of research conducted to address how information in scenarios are interpreted as well as what assumptions participants may make about them (Hughes & Huby, 2004). There are likely to be responses from participants regarding the scenarios that are subjective and are therefore not easily interpreted on a Likert scale. As such, nuanced responses may be lost.

Likert Scale

The reason for the use of the Likert scale rather than requesting dichotomous responses is not provided by the authors. The ordinal nature of the FPS data also places it at a disadvantage with respect to being more limited with analysis, compared to interval data, as there is no meaningful zero that scores can be measured against. However, since the aim is to identify the propensity someone has to set a deliberate fire this is suitable, since Likert scales are the most appropriate for measuring attitudes (Kline, 2000). Therefore, the Likert scale appears to be an apt choice by the researchers.

Self–Report

The FPS is a self–report assessment. In the studies outlined previously, participants have been asked to complete all parts of the questionnaires anonymously and return these in a sealed envelope to the researcher or to submit their answers online, anonymously (Barrowcliffe & Gannon, 2015, 2016; Gannon & Barrowcliffe, 2012). There are obvious benefits to this methodology, not least because it can allow respondents to be as open and honest with little fear of reprisal, when compared to an interview method (Barker, Pistrang, & Elliott, 2016). Anonymity for participants, allows for greater veracity since the participant is not concerned with the possibility of a negative reaction to their responses. Anonymity also reduces the likelihood of issues arising due to varied or biased administering of the assessment (Barker, et al., 2016). Of note, however, is that should the FPS be employed to assess the effect of an intervention, it will not always be possible for the answers to remain anonymous.

Self–report is by no means without difficulties, for instance, self-report can be vulnerable to response bias whereby an individual may want to present themselves in a

favourable way and 'fake good', answering questions in a way that presents them in a positive way. The opposite is 'faking bad' where an individual may have reason to exaggerate difficulties or problems. Finally, an individual may answer arbitrarily or they may believe the researcher is looking for them to answer in a particular way (known as *response set*). The issues outlined above can affect the analysis and conclusions and therefore corroborating findings is particularly important.

Gannon and Barrowcliffe (2012) and Barrowcliffe and Gannon (2015, 2016) managed this issue of response bias by ensuring participants completed an impression management scale, the Balanced Inventory of Desirable Responding (BIDR). This meant the authors of all three studies were able to assess to what extent a participant may have attempted to 'fake good' or 'fake bad' when responding to questions. Neither Gannon and Barrowcliffe (2012) nor Gannon and Barrowcliffe (2015, 2016) found significant differences between the scores of the firesetters and non–firesetters on the BIDR. The findings of all three studies also established that participants' BIDR scores were unrelated to their total FPS scores. Therefore, it can be concluded that there was no statistically significant distorted responding to the FPS in this study and, in this respect, participants' responses can be considered valid.

Reliability

Internal reliability

Internal reliability refers to how consistent the assessment is in terms of whether items within the scale and subscales measure the same general construct and produce similar scores. Therefore, internal reliability measures the extent to which a scale is measuring a single concept (Kline, 2000). Cronbach's alpha is the model of internal consistency that Gannon and Barrowcliffe (2012) employed to analyse the 158

Table 6

Cronbach's α for the four sub-scales and total scores of the Fire Proclivity Scale (FPS) and for the impression management scale, for all three studies

Scale	Cronbach's α; 2012	2015	2016
FPS			
Fire fascination	.82	.86	.71
Behavioural propensity	.68	.66	.81
Fire arousal	.83	.81	.81
Antisociality	.78	.76	.93
Total Score	.82	.93	.82
BIDR	.75	.83	.66

Table 6

participant responses at Time 1 (see Table 6). For the FPS total, score internal consistency was good (α = .82), as well as for the subscales i.e., fire fascination (α = .82) and fire arousal (α = .83). With respect to the remaining two subscales, antisociality and behavioural propensity, results were not as good (α = .78 and α = .68 respectively). The BIDR demonstrated acceptable reliability (α = .75). In both other studies similar levels of internal consistency were found (see Table 6) (Barrowcliffe & Gannon, 2015, 2016). The BIDR also demonstrated good internal consistency in Barrowcliffe and Gannon (2015).

Internal reliability provides information about the correlations between individual items within the scale and sub–scales. Therefore, an assessment does not benefit from an excessively high internal reliability as that might suggest that the

questions are too similar. The scale and sub–scales should be able to provide independent and additional information from each other and therefore maintain enough difference to ensure this. The FPS's Cronbach's alpha scores are good, demonstrating the FPS is not 'too similar' either. This demonstrates that overall the FPS demonstrates a good level of internal consistency and can be considered reasonable in all of the sub–scales, when tested in these samples.

Reliability of an assessment is dependent upon the size of the sample and whether participants in the sample are representative of the population the assessment is developed for (Kline, 2000). A sample that is a poor representation of the population it is examining will impair the extrapolation of results and therefore, compromise reliability of analysis (Kline, 2000). Currently, the relatively limited use, and evaluation of the FPS (Barrowcliffe & Gannon, 2012, 2015, 2016), makes it difficult to confidently assert the reliability. However, further research will provide increased opportunities to support the findings discussed and ensure participant samples and outcomes are truly representative of the general population.

Test-retest reliability

It is essential that test–retest reliability is good, as this assesses whether the measure would produce the same score for a participant at different times (Kline, 2000). In Gannon and Barrowcliffe (2012), Pearson's *r* (correlation analysis) was applied and test–retest reliability was reported for the total score of the FPS as good ($r = .88$) (see Table 7) and also for the sub–scales (fire fascination $r = .85$, behavioural propensity $r = .80$ and fire arousal $r = .86$). The exception is the sub–scale antisociality ($r = .73$) which does not quite achieve the minimum requirement of $r = .80$ to have good test–retest validity. The BIDR indicated good test–retest reliability ($r = .82$). One thing to

Table 7

The test–retest reliability scores as well as scale range for each sub–scale and total score of the FPS. The mean and standard deviation (SD) scores for firesetters and non–firesestters are identified separately.

Scale	Test–retest *r*	Firesetters Mean (SD)	Non–firesetters Mean (SD)	Scale range
FPS				
Fire fascination	.85	18.06 (4.45)	13.01 (5.22)*	6 – 60
Behavioural propensity	.80	15.33 (4.17)	10.44 (3.29)*	6 – 60
Fire arousal	.86	17.22 (4.04)	13.05 (5.07)*	6 – 60
Antisociality	.73	10.17 (3.47)	9.56 (3.55)	6 – 60
Total Score	.88	60.78 (13.98)	46.06 (14.98)*	10 – 100
BIDR	.82	71.89 (14.55)	75.21 (17.07)	20 – 140

Note. Firesetters (n = 18) and Non–firesetters (n = 140)

* $p \leq .001$

Table 7

consider is that it is recommended that there is a minimum period of two weeks (often between 15 and 30 days) break between test and retest dates and at least 100 participants, for results from a correlation analysis to be reliable (Terwee et al., 2007). Gannon and Barrowcliffe (2012) reported a 14 day (range = 10–42 days) break between most of the 158 participants' time 1 and time 2 assessments. In this respect they provide mostly valid data for test–retest reliability, having over 100 participants but not always ensuring the minimum break was adhered to. This should be taken into consideration when analysing the correlation results. Overall, however, it can be said that there is good test–retest reliability with the FPS and despite only the minimum acceptable test and retest timeframe being adhered to, the results can be considered reliable.

Validity

Validity refers to whether an assessment examines what it purports to be examining (Kline, 2000).

Face validity

Face validity refers to whether the materials used and how they are applied seem to be doing what they are designed to do, at *face value* (Kline, 2000). However, it is important to treat face validity for what it is, and not conflate good face value with meaning the assessment is good (Kline, 2000). It is critical that participants are able to answer the questions; that they are clear and straightforward without the questions becoming too directive, which could lead to bias answering (Kline, 2000). The scenarios in the FPS have accessible language, as identified previously and the questions seem to be straightforward in addressing the topic. For instance, the fascination with fire question asked, "in this situation, how fascinated would you be by the fire?". The FPS scenarios and questions both reflect the purpose of the assessment and demonstrate good face validity.

Concurrent validity

Concurrent validity is concerned with whether the assessment correlates with other tests purporting to measure the same construct (Kline, 2000). The dearth of assessments addressing firesetting propensity and intention means it is not possible, currently, to satisfactorily identify the extent of concurrent validity. Concurrent validity is dependent on at least one validated assessment to already exist in order to have a comparison (Kline, 2000). However, establishing a valid test from which others may be compared to requires the creation and development of an initial assessment. Therefore, at some point the first assessment needs to be developed, with acknowledgement that

this may constitute the first foray into attempting to assess that particular topic area. The FPS takes on this responsibility and, understandably, the authors do not report any concurrent validity (Gannon & Barrowcliffe, 2012). The alternative assessments identified at the beginning of this Chapter, present some overlap with propensity to set fires with the FPS, for instance, the IFQ and the FFFS. Although these other scales may have their own issues with validity and reliability (i.e., most are currently unvalidated), they may provide suitable comparison for future research to establish concurrent validity of the FPS. Yet, to date, no published study has compared across the available measures.

Predictive validity

Predictive validity refers to the ability the assessment has to predict future performance (Kline, 2000). The FPS attempts to predict membership to a group of people who have deliberately set fires since the age of 10 years old and remain un–apprehended. In the study by Gannon and Barrowcliffe (2012), participants were asked to anonymously report whether or not they had set at least one fire. From Gannon and Barrowcliffe's (2012) sample of 158 participants, 11.4% (n = 18) reported they had set at least one fire since the age of 10 years old, whilst 88.6% (n = 140) had not. The FPS was subject to a predictive validity analysis, a one–way multivariate analysis of variance (MANOVA), to investigate differences between the un–apprehended firesetters and non–firesetters. As identified in Table 7, the FPS results demonstrated a statistically significant difference between these two groups on the total score (p = .001). When the four sub–scales were considered independently, firesetters scored significantly more highly on three of them; fire fascination index (p = .001), behavioural propensity (p = .001) and arousal (p = .001) (Gannon & Barrowcliffe, 2012). Barrowcliffe and Gannon (2015, 2016) also found apprehended firesetters scored

significantly higher compared to non–firesetting offenders on the total score of the FPS (p = .01) in their sample of 133 (Barrowcliffe & Gannon, 2015) and 204 (Barrowcliffe & Gannon, 2016). They found this to be the case when examining all of the sub–scales independently; behavioural propensity (p < .01), arousal (p < .01) and antisociality (p < .05). The reported analyses demonstrate the FPS has good predictive validity, i.e., it is able to differentiate between firesetters and non–firesetters in both apprehended and un–apprehended populations in the studies conducted so far.

Content validity

Content validity is the extent to which a test measures the behaviour it is intended measure. A test has good content validity if there has been careful selection of which items to include (Kline, 2000). Establishing content validity for the FPS is challenging since the research regarding propensity to set fires is very limited. Without better validated firesetting theories and more research to support understanding of firesetting, it is difficult to say whether the FPS is able to measure all aspects relevant to deliberate firesetting. Therefore, until further research is conducted content validity cannot be determined.

Construct validity

Construct validity refers to whether the interpretation of the assessment scores is consistent with the theoretical basis for the development of the assessment. To consider construct validity the authors must demonstrate that the topic being measured actually exists (Kline, 2000). However, how this is done is not straightforward since there is no one test to determine construct validity (Kline, 2000).

As already stated, Gannon and Barrowcliffe (2012) used the RPS and its theoretical basis as a framework on which to identify proclivity for firesetting. Bohner et al.'s (1998) development of the RPS was to test the application of the 'neutralisation' theory to rape offenders. Utilising this theory, Gannon and Barrowcliffe (2012) attempt to establish the extent to which participants are able to express and be measured for their ability to 'neutralise' their possible inhibitions to deliberately setting fires. This is achieved through asking participants to what extent they agree or align themselves with statements about deliberate firesetting scenarios. The FPS is attempting to measure the connection between proclivity to deliberately set fires and the *act* of deliberately setting fires and in so doing, prove it has construct validity. Gannon and Barrowcliffe (2012) have identified that firesetters score more highly on the FPS and this is consistent with them having greater agreement and alignment with firesetting situations. These findings support the neutralisation theory. Nevertheless, in order to better satisfy the construct validity of the FPS, further research is needed to establish the direct influence propensity to deliberately set fires has on actual firesetting behaviour in the future.

Appropriate norms

An *appropriate norm* is a comparison group whose participants are qualitatively similar to the wider population they represent. It is against this that an individual participant's score on an assessment is compared ("Norms for Psychometric Assessment: Understanding, choosing, and constructing the right norms," n.d.). As highlighted above, the participants in the first study by Gannon and Barrowcliffe (2012) were selected by snowballing and the limitations of selecting participants in this way has been acknowledged by the authors. Barrowcliffe and Gannon (2015, 2016) demonstrated similar scores with a wider range of community population. When comparing the mean scores of the firesetters and the non–firesetters in all three studies,

there were a number of differences identified. Research in the future would benefit from identifying to what extent participants selected for Gannon and Barrowcliffe's (2012) and Barrowcliffe and Gannon's (2015, 2016) research are truly representative of both firesetters and non–firesetters in the wider population. This information would support the development of normative scores for both apprehended and un–apprehended firesetters, as well as non–firesetters.

Conclusion

Overall the FPS can be said to go a considerable way towards meeting scientific criteria and shows potential as a risk assessment of future firesetting. In three studies, the predictive validity was found to be promising and deserving of further research due to the importance of being able to improve our understanding of future risk of firesetting. It is important to acknowledge that these three studies were conducted by the original authors of the FPS scale, which could introduce potential bias as the authors would presumably be keen to confirm the robustness of their scale. Nonetheless the three studies present an essential grounding for establishing the value of the FPS. The use of the neutralisation theory goes some way to supporting the belief that identifying proclivity to commit an offence is an indicator of future behaviour; and the findings of the FPS's discrimination of firesetters and non–firesetters is further indication of this. However, it is important to acknowledge some of the more significant issues with the FPS. The representational nature of the population sample in the three studies conducted to date is questionable and, therefore, extrapolation to the general population remains limited. Also, the lack of supportive research means that identifying concurrent, content and construct validity is challenging and at times weak. Future research, from other research groups, would benefit from continuing to investigate reliability and validity and appropriate analysis of the content of the scenarios. It would

also be appropriate to continue to research and develop robust theoretical constructs against which the FPS can be judged.

It is useful to consider the benefit that a valid, reliable, accessible and easily interpreted assessment of risk of firesetting would have for the development and assessing the effectiveness of firesetting interventions (Gannon & Barrowcliffe, 2012). The FPS represents a good start to addressing this and approaches questions regarding how to predict firesetting propensity. The logical conclusion is to consider the current research on the FPS as a springboard to further develop it as an empirically–based assessment of firesetting propensity.

Chapter 5

General Discussion

"Fire is the best of servants, But what a master!"

Thomas Carlyle

Overview

This thesis began with an outline and overview of our current understanding of deliberate firesetting theories and characteristics including: traits, personalities, and mental health diagnoses of firesetters. It introduced the connection between developing a more comprehensive typology of deliberate firesetting and the value of this for improving our understanding of crime scene behaviours, personality traits and profiling of firesetters (Davis & Bennett, 2016). Chapter two, a systematic review of six studies purporting to encapsulate firesetter types into evidence–based typologies, highlighted the dependency of current typologies on sub–groups of apprehended firesetters (such as Canter & Fritzon, 1998; Icove & Estepp, 1987 or Kocsis & Cooksey, 2002). Chapter three contained a statistical analysis of crime scene behaviours recorded by WMFRS to develop a comprehensive typology of apprehended *and* un–apprehended firesetters. The analysis identified three firesetter types, based on both apprehended and un–apprehended firesetters' firesetting crime scene behaviours. Strengths and weaknesses of the research were also discussed. Finally, Chapter four reviewed the FPS and considered the validity of this assessment to differentiate between un–apprehended firesetters from non–firesetters, in the general population. Chapter four concluded the FPS has potential but acknowledged that the FPS is in its infancy in terms of regular use and therefore requires subsequent validation.

The outcomes and conclusions of this thesis have begun to address the problems identified in the introduction. Below, describes how the thesis has addressed the three main aims, stated in the introduction.

Aim 1: Develop a comprehensive overview of the current, relevant, empirically based firesetter types: Published research supports the importance of addressing

topics related to better inform understanding of firesetters (Gannon & Pina, 2010; Lambie & Randell, 2011; Tyler & Gannon, 2012). This thesis argued that there is a dearth of well–developed and validated firesetter types in current literature. This thesis has attempted to address the difficulties of developing a consistent and replicable firesetter typology that includes both apprehended and un–apprehended firesetters that this thesis has attempted to address. The issue of a consistent and replicable firesetter typology that included both apprehended and un–apprehended firesetters was explored in Chapter two, in a systematic literature review where six empirically based firesetter typologies were identified within the firesetting research. The six typologies all had issues relating to their population selection and replicability, including the omission of un–apprehended firesetters (Gannon & Pina, 2010; Lambie & Randell, 2011; Prins, 1994; Tyler & Gannon; 2012). The systematic literature review examined the typologies and discussed the challenges of selecting firesetters for research, from a population consisting only of apprehended firesetters (Lambie & Randell, 2011). For instance, Chapter two demonstrated that the generalisability of the current typologies, as well as methods for comparing firesetter types across typologies, is currently limited. The conclusion from this comprehensive review is that the typologies identified are currently not able to provide an overview of both apprehended and un–apprehended firesetter types, which is required to effectively address risk and detection (Kennedy et al., 2016; Tyler & Gannon, 2012).

Aim 2: Explore the value of utilising crime scene behaviours in developing understanding of firesetters: Chapter two critically considered the use of 'assumed firesetter motivations' to differentiate between the firesetter types identified in the six studies discussed. The inherent difficulties associated with attributing firesetter motivation were raised in Chapter two, as well as the value of utilising crime scene

behaviours as a more objective and empirically based selection of variables from which to develop firesetter types (Davis & Bennett, 2016). Chapter three examined the firesetting crime scene behaviour of both apprehended and un–apprehended firesetters using crime scene behaviour variables recorded by the WMFRS. The value of identifying motivation for setting deliberate fires was recognised, particularly when developing individual interventions to address specific triggers and areas of risk or deficit. However, when considering the overall knowledge base of firesetters, motivation can prove to be difficult to identify and possibly detract from developing a clear, impartial and unbiased perspective on the different types of firesetters (Davis & Bennett, 2006; Green et al., 2014; Icove & Estepp, 1987). Crime scene behaviours were presented as an independent and detailed reference point from which to establish different types of apprehended and un–apprehended firesetters. It was demonstrated that these variables can be used to develop a typology of apprehended and un–apprehended firesetters. This thesis argues that it is possible to identify specific types of firesetters based solely upon their firesetting crime scene behaviours and, therefore, examining crime scene behaviours can support the direction of investigation. (Davis & Bennett, 2016).

Aim 3: Contribute to our understanding of both detected and undetected firesetter types through analysis of their crime scene behaviours: The research, detailed in Chapter three, reveals three firesetter types that, it is argued, are more representative of apprehended and un–apprehended firesetter types than previous research identified in the SLR (Chapter two). This is because the types are based upon the crime scene behaviour variables and are not dependent upon identifying firesetters' motivations. It is also the only known firesetter typology that attempts to represent both apprehended and un–apprehended firesetters. The research described in Chapter three highlights the

three most common firesetter crime scene behaviour variables, a 'Miscellaneous, Uninhabited or Derelict' target, occurring during a 'Weekday' and during 'Daylight' hours. This finding identifies the firesetting crime scene behaviours most likely to be expressed by firesetters and has implications for those working to reduce firesetting incidences. Thus, this thesis has developed an arguably more accurate representation of firesetter types and their associated crime scene behaviours. The typology has been developed through the research analysis and outcomes reported in Chapter three which were based upon the crime scene behaviours of both apprehended and un–apprehended firesetters.

Having identified the value and importance of identifying the traits and crime scene behaviours of all firesetters, the FPS was developed, in part, to address gaps in our knowledge of un–apprehended firesetters (Barrowcliffe & Gannon, 2015). The FPS, discussed in Chapter four, demonstrates the possibility of gathering data on, and developing greater understanding of, the demographics of un–apprehended firesetters. The validity of the FPS has been demonstrated in this thesis and tentative support has been given for its capacity to further our understanding of all firesetters.

Practice implications

This thesis has demonstrated and lent further support to previous findings that it is likely that young people represent a high proportion of un–apprehended firesetters (Canter & Almond, 2002; Canter & Fritzon, 1998; Del Bove, 2005; Icove & Estepp, 1987). Analysis of the WMFRS data found a high frequency of targets such as miscellaneous items, including: bins, small buildings and derelict/abandoned buildings and the identification of a type of firesetter who appears to be predominantly focused on setting fire to cars at night. Research has already established that young people are

more likely to set smaller fires and set fires to cars – possibly to conceal joyriding or car theft which is more likely to be committed by younger individuals (Canter & Almond, 2002).

Information about the behaviours of apprehended and un–apprehended firesetters and greater understanding of those who are likely to set fires can inform the development and focus of interventions to address firesetter target 'hotspots' and the value of preventative work with young people and children. The Fire Proclivity Scale (FPS; Gannon & Barrowcliffe, 2012) has been identified as valid (Chapter four) and, therefore, could be used as a tool to be incorporated into interventions within schools and young people to further assess an individual's firesetting propensity. Results of the FPS could be utilised to ensure both the efficient focus of interventions on particular schools and/or year groups who are most at risk, as well as possibly providing a measure of the effectiveness of interventions. Effectiveness of interventions could be demonstrated through a reduction of propensity to set fires, according to the FPS, after intervention has been completed.

With respect to detection of firesetters and supporting investigative efforts, this research identifies what might be considered as more common firesetting crime scene behaviours and, therefore, those likely to be seen when dealing with the majority of firesetters. This identification of 'normal' firesetting behaviour will aid those investigating firesetting through highlighting crime scene behaviours that do not conform to this. It is possible that identification of 'less common' crime scene behaviours could aid offence linking, by comparing firesetting incidents that share crime scene behaviour (Santilla, Fritzon, & Tamelander, 2004). Consistency of crime scene behaviours for firesetters was acknowledged in Chapter one. It was noted that

firesetters' crime scene behaviours are relevant for investigators to focus on, due to the lack of influence a victim may have for this type of offence, particularly when compared to other violent offences such as rape, where the behaviour and response of a victim can impact upon the offenders offence behaviours (Davis & Bennett, 2016; Santilla, et al., 2004).

This thesis has placed a focus on investigative use, however, it is important to acknowledge that the identification and treatment of firesetters is also inextricably linked. This is because, without being able to detect all firesetters, both an understanding of them is lacking and the capacity to treat is reduced. Thus, it is suggested that being better able to understand and explain firesetters and their crime scene behaviours, will inevitably lead to increased capacity to identify, treat and manage the risk of firesetters (Canter & Almond, 2002; Doley, 2003).

Theoretical implications

The ongoing development of theories to support an understanding of firesetting is important. Chapter one highlighted the M–TAFF, developed by Gannon, Ó Ciardha, Doley and Alleyne (2012), as a particularly informative theory. In Chapter three, the M-TAFF was considered in relation to the three firesetter types identified in the WMFRS dataset. Part of the M–TAFF theory reports that critical risk factors include traits such as inappropriate fire interest, offence supportive attitudes, self–regulation issues and communication difficulties (Gannon, 2016; Ó Ciardha & Gannon, 2011). Inappropriate fire interest and a belief that fire is controllable (offence supportive attitude) are stated as integral elements of the M–TTAFF theory of deliberate firesetting (Ó Ciardha & Gannon, 2011). The findings of the research, in Chapter three, identified Types 'A' and 'C' as likely to be the types of fires set by younger people and children.

As already argued in Chapter three, the identification of these two types demonstrated support for a significant proportion of deliberately set fires to have been instigated by children and young people. Young people's fire interest and positive attitude towards the 'fun' of firesetting, as well as their perception that it can be controlled, is consistent with the M–TAFF theory (Canter & Almond, 2002). Therefore, the research findings reported in this thesis demonstrate some support for the M–TAFF theory.

Research recommendations

The links made between the M–TAFF theory and firesetter types 'A' and 'C' identified in Chapter three, are promising. The critique of the FPS in Chapter four, demonstrated the potential for this assessment to further explore and support this link. It is recommended that further research on the FPS to consolidate the validation of the scale would be beneficial. The M–TAFF theory hypothesises that the fascination and enjoyment of firesetting, as well as a belief in one's ability to control fire, predict the likelihood of firesetting behaviour. The FPS measures fascination and enjoyment of deliberate firesetting (Gannon & Barrowcliffe, 2011; Ó Ciardha & Gannon, 2011). This thesis proposed that 'A' and 'C' firesetter types are likely to have a raised fascination with and enjoyment of firesetting. Therefore, it follows that fire fascination and enjoyment of firesetting in both apprehended and un–apprehended firesetters is a potentially fruitful area of further investigation. Specifically, research focused on assessing un–apprehended firesetting in children and young adults, through the application of the FPS, would be beneficial in further developing understanding of typical and atypical levels of enjoyment and fascination with firesetting amongst what may be, a large proportion of un–apprehended firesetters. Comparing the results of the FPS between groups of apprehended and un–apprehended firesetters of all ages would also be a gainful area of further research. This would allow for further development of

our understanding of the differences in fire fascination and fire enjoyment between apprehended and un–apprehended firesetters. It would be useful to follow up those identified as likely to have a propensity to set fires with further exploration of their demographic data and personality traits. It is further hypothesised that firesetter types 'A' and 'C' identified in Chapter three, are likely to score highly on the FPS and research to further explore this is also recommended.

Moreover, the FPS could be further researched with respect to the scale being utilised to identify particular geographical areas where there is greater propensity for firesetting. For example, if utilised in schools and colleges it could be used to ensure the appropriate targeting of intervention resources. The FPS could also be developed through research as a possible evaluation of the effectiveness of interventions, to assess whether there is a decrease in propensity after a particular intervention has been completed (Barrowcliffe & Gannon, 2015; Gannon & Barrowcliffe, 2012; Ó Ciardha, Tyler, & Gannon, 2015). The value of this use was noted by the authors, Gannon and Barrowcliffe (2011), however, so far there is no published research to examine the FPS's ability to assess the effectiveness of an intervention addressing firesetting.

This thesis has useful and important findings with respect to the development of a universal firesetter typology representing three types of firesetter (called types 'A', 'B' and 'C', in Chapter three). Previously, the picture of firesetting was only partially complete due research being based upon apprehended firesetters (Lambie & Randell, 2011). The findings of this thesis support the importance of a typology of firesetters being based on *both* apprehended and un–apprehended firesetters. Future research would benefit from identifying similar ways of analysing firesetting data from both apprehended and un–apprehended firesetters and verifying or further developing the

firesetting types identified in Chapter three. Being able to further validate the typology identified in this thesis with different samples will add to the value and applicability of the firesetter types presented in Chapter three.

Finally, the thesis also presents a competent argument for further research into firesetting crime scene behaviours as an objective way of gaining better understanding of firesetters. While the thesis does not claim that the entirety of our understanding of firesetters can be comprised wholly from crime scene behaviours, it does present a persuasive argument for the reduction in the use of offender motivation as a key differentiating factor for developing firesetter types. The importance of identifying and using objective and empirically based traits and crime scene behaviours to increase understanding of apprehended and un–apprehended firesetters is paramount. Future research could consider the crime scene behaviour variables alongside socio–economic traits, personality differences and other objective measures and identifiers (Davis & Bennett, 2016). This would contribute to improving our understanding of the traits and behaviours of firesetters, developing treatment approaches, support investigative endeavours and better management of risk of deliberate firesetters.

In sum, this thesis has developed a comprehensive overview of the current, relevant, empirically based firesetter types; explored the value of utilising crime scene behaviours in developing understanding of firesetters; and contributed to our understanding of all firesetter types through analysis of their crime scene behaviours. Areas for future research have been highlighted and the thesis has identified the need to explore both apprehended and un–apprehended firesetter's crime scene behaviours, personality traits and demographics to further our understanding of firesetters.

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Appendix 1

Dear

I am a Trainee Forensic Psychologist completing a Doctorate with the University of Birmingham. I am currently conducting a systematic review of studies into arson and firesetting typologies. As you are someone with experience and expertise in the arson/firesetting field I am writing to ask if you have, or are aware of, any unpublished research studies, data, or other work in this area which may be of relevance to my review? I would also be very grateful if you were able to alert me to any relevant research which may currently be underway or 'in press'.

I am keen to be as inclusive as possible with my review and to include any research that has not been published.

Many thanks for your time, and I hope to hear from you soon.

Kind Regards,
Vicki

Appendix 2

162 studies found from searches conducted on databases;

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Appendix 3

Quality Research Assessment

Study identification: Include author, year of publication, title, reference		
Guidance topic:	**Key research question/aim:**	
Checklist completed by:	Vicki Parker	
Theoretical approach		
1. Is the study clear in what it seeks to do, its aims? • Is the purpose of the study discussed – aims/objectives/research question/s? • Is there adequate/appropriate reference to the literature? • Are underpinning values/assumptions/theory discussed? • What was the goal of the research? • Why it was thought important?	Clear Unclear Mixed	Comments:
Study design		
2. How defensible/rigorous is the research design/methodology? • Is the design appropriate to the research question? • Is a rationale given for using a qualitative approach? • Are there clear accounts of the rationale/justification for the sampling, data collection and data analysis techniques used?	Defensible Indefensible Not sure	Comments:

• Is the selection of cases/sampling strategy theoretically justified?		
3. Is the selection of cases or participants theoretically justified? • Is it clear what population the sample refers to? • Is consideration given to whether the units chosen were unusual in some important way?	Justified Unjustified Mixed	Comments:
Data collection		
4. How well was the data collection carried out? • Are the data collection methods clearly described? • Were the appropriate data collected to address the research question? • Was the data collection and record keeping systematic?	Appropriately Inappropriately Not sure/inadequately reported	Comments:
5. Was the data collected reliable and did it address the research issue? • Is it clear how data were collected (e.g. focus group, semi–structured interview etc.)? • Are there clear accounts of the criteria used for the selection of subjects for study? • Do the methods investigate what they claim to? • Did the researcher justify the methods chosen?	Addressed/Reliable Not addressed/Unreliable Not sure	Comments:
Trustworthiness		

6. Is the role of the researcher clearly described? • Has the relationship between the researcher and the participants been adequately considered? • Does the paper describe how the research was explained and presented to the participants?	Clearly described Unclear Not described	Comments:
7. Is the context clearly described? • Are the characteristics of the participants and settings clearly defined? • Were observations made in a sufficient variety of circumstances? • Was context bias considered? • Does the sensitivity of the methods match the needs of the research question?	Clear Unclear Not sure	Comments:
Analysis		
8. Is the data analysis sufficiently rigorous? • Is the procedure explicit – i.e. is it clear how the data was analysed to arrive at the results? • How systematic is the analysis, is the procedure reliable/dependable? • Is it clear how the themes and concepts were derived from the data? • What steps were taken to guard against selectivity in the use of data?	Rigorous Not rigorous Not sure/not reported	Comments:
9. Is the data 'rich'? • How well are the contexts of the data described?	Rich Poor	Comments:

• Has the diversity of perspective and content been explored? • How well has the detail and depth been demonstrated? • Are responses compared and contrasted across groups/sites?	Not sure/not reported	
10. Is the analysis reliable? • Did more than 1 researcher theme and code transcripts/data? • If so, how were differences resolved? • Did participants feed back on the transcripts/data if possible and relevant? • Were negative/discrepant results addressed or ignored? • Is reference made to accepted procedures for analysis?	Reliable Unreliable Not sure/not reported	Comments:
11. Are the findings convincing? • Are the findings clearly presented? • Are the findings internally coherent? • Are extracts from the original data included? • Are the data appropriately referenced? • Is the reporting clear and coherent?	Convincing Not convincing Not sure	Comments:
12. Are the findings relevant to the aims of the study? • Is there adequate discussion of how themes, concepts and categories were derived from the data?	Relevant Irrelevant Partially relevant	Comments:

• Is there adequate discussion of the evidence both for and against the researcher's arguments?		
13. Conclusions • How clear are the links between data, interpretation and conclusions? • Are the conclusions plausible and coherent? • Have alternative explanations been explored and discounted? • Does this enhance understanding of the research topic? • Are the implications of the research clearly defined? • Are the results credible and appropriate? • How valuable is the research? • Is there adequate discussion of any limitations encountered?	Adequate Inadequate Not sure	Comments:
Ethics		
14. How clear and coherent is the reporting of ethics? • Have ethical issues been taken into consideration and the study approved by an ethics committee? • Are they adequately discussed e.g. do they address consent and anonymity? • Have the consequences of the research been considered i.e. raising expectations, changing behaviour?	Appropriate Inappropriate Not sure/not reported	Comments:
Overall assessment		

As far as can be ascertained from the paper, how well was the study conducted?	++ (good) + (acceptable) − (poor)	Comments:

Appendix 4

Data Extraction Form

General Information • Author • Title • Publication type and year	
Design	
Definition of firesetting	
Characteristics	
Data source and timescale	
Variables extracted	
Outcome	
Bias	
Comments	
Quality Assessment rating	

Appendix 5

Hello,

I am a PhD student based at the Forensic and Criminological Psychology department at the University of Birmingham and my research is on arson. I am specifically interested in drawing together the data on the IRS or potentially the FDR1 and FDR3 forms and considering ways to link arson offences through scene similarities/differences. I would aim to develop this in such a way as to aid and support the Fire Service to increase the detection rate of arson incidents'. I am very keen for my research to benefit the Fire Service.

Could you please advise on the best way forward with accessing these records?

Many Thanks,
Vicki

Vicki Parker
Trainee Forensic Psychologist FT

Tel: 07*** ***192

Appendix 6

WMFRS Data and Variables
Daylight or Night time
Time of day for callout
Weekday or Weekend
Day of the week
Spring, Summer, Winter or Autumn
Month
Residential
Converted flats/maisonette
Purpose built flats/maisonette
Semi–detached house
Terraced house
Student hall of residence
Semi–detached house
Converted HMO flats/maisonette
Nurse's/Doctor's accommodation
Children's home
Gymnasium/College/Student hall of residence
Hotel/Motel
HMO Terraced house
Business
Cleaning Services or laundrette
Shopping Centre or Retail Park
Public House
Other types of Public House or Bar
Pawnbroker
Kiosk (including market stall)
Butcher
Biological laboratory
Supermarket
Portacabin
Temporary Office and Admin

Multi–storey car park
Vehicle repair and servicing garage
Separate sports pavilion/shower block/changing facility
Gymnasium
Manufacture – metals manufacturers, fabricators and stockholders
Bookmaker
Cafe
Indian and Asian restaurant
Fast food or takeaway outlet
Fish and chip shop
Turkish restaurant
Pizza restaurant
Other type of venue or club
Art Galleries
Snooker, billiard or pool hall
Youth club/centre
Social club
Cinema
Nightclub
School/Educational Establishment
Local Authority Secondary school
University
Local Authority pre–school and Nursery
College
Civic building (public have access)
Leisure Centre
Public administration
Places of worship
Public, community or village hall
Rugby stadium
Hospital/Institution
Local authority general hospital
Local authority psychiatric hospital
Private psychiatric hospital

Health Centre
Dental surgery
Prison
Car/Vehicle
Minibus
Caravan
Derelict vehicle
Motorhome
Motoryacht
Lorry/HGV
Motorcycle
Bicycle
Other road vehicle powered by engine or motor
Miscellaneous/Uninhabited/Derelict property and items
Stacked/baled crop
Trees or hedgerow
Wasteland
Allotments
Pastures and grazing
Heathland/Moorland
Parkland
Scrubland and other types of grassland
Roadside verge or vegetation
Fence/Railway trackside vegetation
Canal or riverbank vegetation
Domestic garden
Bin bag
Container and storage
Loose refuse/rubbisah
Household wheelie bin
Stable
Other rubbish item (e.g. dumped/discarded sofa or mattress)
Rubbish bin
Any small refuse container outside

Large refuse
Skip
Other secondary fire item (e.g. garden toys and furniture)
Garden equipment (e.g. lawnmowers)
Landfill site
Derelict building
Recycling collection point or bottle bank
Scrapyard
Private detached outhouse or bin/storeroom
Bus shelter
Outdoor storage
Private detached garage
Other type of outside structure
Barn
Private detached shed/garden shed
Allotments
Post box
Public Toilet
Kennel

Appendix 7

Situation 1

Billie is a 15-year-old who had spent the weekend being bored. Billie decided to go to the local wreck to see if anyone wanted to hang out. There were already a few people there just hanging around and chatting. One of them lit a cigarette. The sight of the flame shooting out of the lighter gave Billie an idea. Billie decided to set a rubbish bin alight. Billie lit a piece of rubbish and dropped it into the bin. The rest of the rubbish burned and the bin began to melt whilst Billie and the group carried on chatting and hanging out.

Situation 2

Tony felt constrained by life conforming to the rules and regulations of society but in the country Tony felt free and relaxed. Nature appealed to Tony because it is free and natural, plants are free to grow, the wind is able to blow and butterflies flutter by as they please. One quiet Sunday evening Tony decided to light a twig on fire. Tony watched as the flames were also free to flicker and move as they pleased. From the burning twig, Tony then lit a pile of dried leaves and watched and listened as the leaves crackled when embraced by the flames.

Situation 3

Hillary had finished sorting through the paperwork and had accumulated a large pile of old papers. Hillary took the old papers to the bottom of the garden and put them in a pile. Hillary then lit the corners of a few of the papers at the bottom of the pile. Hillary stood back and watched as the flames slowly crept up the side of the stack of papers. Hillary watched as the flames danced about freely in the breeze engulfing the whole

stack of papers until eventually the old pile of papers were reduced to a pile of ashes.

Situation 4

Jo and the other locals would often dare each other to play pranks on the adults in the street. The neighbourhood was fairly posh and most people lived in large gated properties with big gardens. Some people had electric gates whilst others had picket fences but most people had letter and newspaper boxes attached to either their fence or gate. One day whilst Jo was delivering papers it was agreed that when the paper was put into the newspaper box it would be set alight. So Jo lit the corner of the paper and popped it into the newspaper box and then carried on with the rest of the paper round.

Situation 5

Terry had always had an interest in fire and became excited when thinking about fire. Often when alone either at work or at home Terry would light matches. Terry watched as the intensity and the colour of the flame changed as more of the match began to burn. As the flame began to die out but before totally extinguished Terry lit another match from the original flame. Terry was fascinated by the falling trail of ash left behind by the burning match and by the intensity of the heat from one little flame.

Situation 6

Sammy and the others in the group were very mischievous. They spent most of their weekends creating some sort of graffiti on the local bus station walls. One weekend they decided to reduce the problem of old bus tickets littering the floor by setting fire to them. This then progressed to lighting the corners of posters hanging on the walls and watching them crinkle up and fall of the walls creating little piles of ashes.