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The Classification of Deliberate Firesetting

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Abstract

The construction of typologies and classification systems has proved highly popular in the area of deliberate firesetting, particularly for developing units of explanation for this behaviour. However, the methods and approaches applied to the classification of firesetting have arguably stunted academic and clinical understanding of this behaviour. As a result, firesetting remains a poorly understood behaviour and meaningful classification systems to guide assessment and treatment are in their infancy. This article aims to review and critique existing classification systems for deliberate firesetting. The strengths and weaknesses of classificatory approaches in the extant literature are considered and suggestions as to how future research may approach classification of firesetting, so as to advance knowledge of this behaviour, are presented.

Keywords: *firesetting, arson, classification, typologies, subtypes*

The Classification of Deliberate Firesetting

Intentional firesetting[1], is responsible for significant levels of human, economic, and societal harm every year. Figures indicate that tens of thousands of fires are deliberately ignited in the USA, UK, New Zealand and Australia annually (Campbell, 2017; Home Office, 2017; Fire and Emergency New Zealand, 2019; Smith et al., 2014). Given the significant damage caused by deliberate firesetting each year, surprisingly little is known about this behaviour and those who engage in it. Research to date has sought to understand firesetting through examining similarities and differences in the characteristics of those who set fires as well as between those who set fires and those who do not. Within this body of research, attention has been given to the development of classification systems to aid explanation and guide empirical investigation of this behaviour (Doley, 2003).

The primary focus of classification in the area of firesetting has been to offer some level of explanation for why people intentionally start fires. Using classification to identify features shared by those who have engaged in a certain behaviour is particularly helpful in areas that have little explanatory theory for describing individuals' problems, generating hypotheses, and developing building blocks for explanation (Ward & Carter, 2019). Due to the lack of theoretical frameworks for firesetting, classification has proved particularly popular (Gannon & Pina, 2010).

Historically, classification of deliberate firesetting has mainly focused on categorising individuals based on single arbitrary characteristics (e.g., age, sex) or their hypothesized motive for firesetting. Recently, however, more complex classification systems have been developed incorporating a range of crime scene, individual, motivational, and psychological factors, and utilising various conceptual and statistical methods, to both examine the

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[1] The term firesetting will be used throughout this paper to describe all deliberate acts of setting a fire regardless of their legal status.

heterogeneity of those who set fires as well as to identify core features to guide investigation, assessment, and treatment of this behaviour (see Table 1 for an overview).

The aim of this article is to provide a critical review of the different approaches to classification within the firesetting literature, including motivation-based typologies, crime scene classification systems, statistically derived models, and multi-modal frameworks. Each method of classification will be described, and its strengths and weaknesses discussed. When critiquing each classification system, attention will be paid to the features of good classificatory categories as outlined by Ward and Carter (2019): (1) categories should be relatively discrete, (2) categories should not be based on arbitrary properties, (3) categories should contain more than one property and, (4) categories should serve as 'seeds' for developing mechanistic explanations. Finally, suggestions of how to improve the classification of deliberate firesetting will be presented. Unless otherwise stated, this review focuses on the classification of adult firesetting. This is because the vast majority of classification research has focused on adult populations with children and adolescents often being treated as a single category within these (a serious issue in itself).

[Insert Table 1 about here]

Atheoretical classifications

Motive/characteristic-based classification

Unilateral systems. Motive based classification has proved especially popular in the area of deliberate firesetting, with a proliferation of motivational typologies developed between the 1970's and 2000's (for a detailed overview of motivational typologies for firesetting see Dickens & Sugarman, 2012). One of the earliest classification systems for deliberate firesetting was developed by Lewis and Yarnell (1951). Lewis and Yarnell (1951) extracted approximately 2,000 firesetting records from the National Board of Fire Underwriters in the USA, as well as cases from various fire marshals and psychiatric

services. Following the elimination of cases in which data was incomplete or "sketchy" (these predominantly related to incidents of firesetting by groups of young men in the course of other antisocial behaviour or for excitement) or where the firesetting had been for profit, they reviewed the insurance records for firesetting cases involving 1145 adult males, 201 adult females, and 200 mixed sex youth.

Lewis and Yarnell (1951) identified five dominant 'types' of individuals who had set fires based on core characteristics or motives: (1) *accidental or unintentional group* (where a fire is set as a result of temporary confusion or cognitive impairment) (2) *delusional group* (e.g., those experiencing symptoms of psychosis), (3) *erotic group* (e.g., those excited or aroused by fire including pyromania traits and sexual arousal), (4) *revenge-spite group* (e.g., those who feel slighted or jealous) and, (5) *children*. Within their sample, Lewis and Yarnell (1951) further distinguished between: *pyromaniacs, volunteer firemen, would-be hero's, vagrants, psychotics, sexually motivated firesetting, children, adolescents,* and *females*. However, whilst these subtypes represent additional levels within the classification system, they do not appear to aid the categorisation of individuals within the overarching dominant groups (e.g., unintentional, delusional, erotic, revenge, and children).

Lewis and Yarnell's (1951) study lay the foundations for further motive-based classification research in the field, with several attempts to revise and refine their original typologies (e.g., Bradford, 1982; Inciardi, 1970). Icove and Estepp (1987) conducted one of the largest of these studies on motivation for firesetting. They interviewed 1,016 young people and adults arrested for arson and fire-related offences by the Fire Prevention Bureau in the USA. Icove and Estepp (1987) categorised participants into six motive-based groupings: *vandalism, excitement, revenge, other, crime concealment*, and *profit*. In addition to classifying participants by their motivation, Icove and Estepp (1987) examined the relationship between various profile characteristics (e.g., crime scene behaviours, target of

fire, demographics, socioeconomic information, substance use, and offending history) and the motive-based subtypes. *Vandalism* represented the largest proportion of cases classified (49%), and predominantly consisted of young people who set fires in groups, who were from lower-middle class background, lived at home with their parents, and set fires locally using readily available materials. *Excitement* was recorded as a motive for a quarter of classified cases (25%). This subtype comprised young people who no longer lived with their parents, set fires alone, and a significant minority had previous contact with fire or police officials. The motive of *revenge* was recorded for 14% of participants. The majority in this category were adults, with females being significantly represented (28%); firesetting was often planned and residential properties were often a target. Individuals motivated by *crime concealment* (2%) were predominantly single adult males with a history of offending, low levels of income, and under the influence of substances at the time of the firesetting. *Profit* was identified as a motive for 1% of participants and tended to be youth with a history of contact with the police who set fires away from home using incendiary devices. The final category of *other* represented 8% of the sample and comprised those with "undetermined motives".

While Icove and Estepp's (1987) classification system initially grouped firesetting individuals by motive, their analysis indicated these groups also differed on individual characteristics. However, 8% of participants ($n = 82$) were classified as having an "undetermined motive", suggesting that classifying firesetting by motivation may be difficult or limited. Further, when closely examining the motivations grouped within each category there is arguably some misalignment between the overarching and specific categories. For example, under *vandalism* "children playing with fire" is listed as a sub-category (a characteristic rather than an underlying motive), and *excitement* includes motives such as "attention seeking" and "sexual perversion" which arguably reflect different constructs.

[Insert Table 2 about here]

Throughout the 1980s and 1990s a plethora of unilateral motive-based classification systems emerged, each categorising and operationalising motivation in slightly different ways and using varying numbers of categories (see Table 2 for a summary). Rix (1994) examined the fit of three pre-existing motive-based classification systems, two of which were unilateral systems (e.g., Inciardi, 1970; Prins, 1985), in a sample of 153 adults (129 males, 24 females) charged with arson who had been referred for pre-trial psychiatric assessment. Rix concluded that all three approaches were unsatisfactory, noting that a fundamental issue with pre-existing classification systems is that they contained categories which referred to individual attributes not just motives (e.g., 'institutionalised' and 'children'). To address this, Rix developed a fifteen category motive-based classification system which included several categories not included in previous classifications (e.g., *re-housing, attempted suicide, carelessness, other manipulative, heroism, proxy, antidepressant, political*). Rix expanding the number of categories in the motive-based classification system overcomes some of the issues around unsatisfactory fit. However, this approach also highlights a need to keep changing and expanding motive-based classifications. In other words, how helpful is motive as a differentiating unit?

Dichotomous and Tripartite Systems. A number of researchers have attempted to simplify motivation-based classification systems using dichotomous or tripartite models. Dichotomous and tripartite systems aim to overcome some of the issues associated with unilateral approaches by grouping motivations for firesetting by their shared overarching features. Scott (1974) proposed one of the earliest dichotomous classifications for deliberate firesetting, hypothesizing that individuals who set fires were either *motivated* or *motiveless*. Within the *motivated* subtype, "valid" drivers for firesetting included profit (e.g., crime concealment), political fire-raising (e.g., aggression and depression), and ordeal by fire (e.g.,

suicidal protest and suicide for non-political reasons). *Motiveless* firesetting is described as representing those who intentionally start fires "as an end itself" (p.79). Somewhat confusingly, fires started out of revenge, as part of heroic games, due to an attraction or fascination with fire, and firesetting by children are all included in the *motiveless* firesetting category. As noted by Gannon and Pina (2010), "the logic underpinning this dichotomy appears severely compromised since many fires with apparent motive … were classified by Scott as motiveless" (p.228). Further, whether intentional behaviour can really be considered motiveless is questionable and is unhelpful for understanding the aetiology of firesetting by individuals in this category.

Levin (1976) (expanded on by Vreeland & Levin, 1980) utilised a different approach to that of Scott (1974), classifying firesetting individuals as engaging in either *for-profit*, *solitary* or *group-based* firesetting. Various motivations in the literature were then associated with each category, except *for-profit* which was classified separately. *Solitary* firesetting individuals were suggested to set fires in secret and be motivated by pyromania type features (e.g., interest, fascination or urges to set fires), heroic status, symptoms of psychosis, relationship factors, and sexual interest. *Group-based* firesetting individuals were said to be motivated by political purposes, vandalism, and riot/protest. Whilst Levin's (1976) tripartite system offers a simplistic model by which to classify firesetting, the three overarching categories conflate offence characteristics and motives, limiting its clinical utility (Gannon & Pina, 2010).

A more intuitively appealing dichotomy was proposed by Faulk (1988; 2000) based on whether the fire could be seen as (a) a means to an end (e.g., insurance fraud, profit, crime concealment, political motives, gang activities, revenge, cry for help, to feel powerful, heroic status, or suicide) or (b) an object of interest itself (e.g., impulse to set fires, sexual excitement, or tension and depression reduction). The instrumental-intrinsic function division

appears to overcome the conflation of concepts identified in other dichotomous and tripartite classifications. Barker (1994) adopted a similar approach, classifying motives for firesetting into four different types of aggression, using Edmunds' (1978) criteria: *acquisitive* (attacking an innocent person or their property for personal gain), *vindictive* (aimed at hurting a perceived aggressor), *instrumental* (firesetting as a means to an end), and *cathartic* (expression of emotion). *Acquisitive* firesetting was associated with motives such as profit or financial gain; *vindictive* firesetting was associated with revenge and jealousy; *instrumental firesetting* was associated with politically motivated activities, cry for help, self-injury and suicide, children, and heroic status; *cathartic* firesetting was associated with motives including sexual pleasure, vandalism, boredom, excitement or relief of tension. In addition to the four clusters above, Barker also included a *no obvious motive* category which included factors that may impair an individual's thinking or cognitive functioning but were not motivations *per se* (e.g., intoxication and symptoms of psychosis) and instances where a motive was difficult to identify or not reported. Faulk (1988) and Barker's (1994) approaches circumvent some of the issues associated with other dichotomous and tripartite classification systems by grouping motivations according to their underlying function. However, the inclusion of "no obvious motive" in Barker's classification highlights the inherent difficulties with identifying motives for firesetting.

Motive-based classifications have been useful for providing academics and practitioners with an understanding of the key motivations associated with deliberate firesetting, with some motives consistently identified across studies (e.g., revenge, excitement, crime concealment, vandalism, and mental disorder). However, there are several issues with this approach which limits its overall clinical utility. First, a significant issue associated with unilateral motive-based classification systems is that drivers for human behaviour (including offending) are often not mutually exclusive, with co-occurring and

overlapping motives common (Koson & Dvoskin, 1982; Puri et al., 1995; Rider, 1980; see Gannon & Pina, 2010). Thus, the resulting classificatory system is often inadequate. Second, there is a lot of inconsistency in how motivations are labelled, grouped, and defined across studies and samples; with this often being at the researcher's discretion (Rider, 1980). Third, due to the subjective way categories are derived (e.g., clinical observation or subjective coding) and the highly selective samples used, the different classification systems often confuse and contradict one another (Geller, 1992; Rider, 1980). This suggests that although some motives are consistently identified, motive-based classification systems do not consist of clear and discrete categories. Fourth, the focus on single motives supplemented by arbitrary properties such as age, sex, and employment and living status, does not account for repeat firesetting where different motives are present and limits the explanatory value of the typologies; producing profiles of individuals based on basic characteristics rather than generating "seeds" of mechanistic explanation. Finally, researchers have acknowledged that motives are not necessarily exclusive to offence behaviours (Vreeland & Levin, 1980). Thus, function or motivation alone is unlikely to provide a useful and meaningful system by which to classify individuals who set fires.

Crime scene classification systems

Crime scene classification systems use investigative and criminal profiling techniques to extrapolate characteristics and behavioural features of firesetting individuals based on crime scene and perpetrator information, collected from solved cases (e.g., police records or prison files). The primary purpose of crime scene classification systems is to aid the investigation of crime through the development of typological profiles of perpetrators. Such systems are based on the premise that the way a person commits a crime is reflective of their non-criminal interpersonal behaviour (Douglas et al., 2013). However, researchers have also suggested that crime scene classification systems have an explanatory function, since they

capture both behavioural and personal characteristics of firesetting and relate these to non-offending behaviours (Fritzon, 2012). Davis and Bennett (2016) suggest that crime scene classification systems for firesetting have adopted three different approaches: the FBI crime classification approach, behavioural facet models, and serial arson models.

FBI crime classification approach. Behavioural analysts at the FBI's National Center for the Analysis of Violent Crime, were the first to develop typologies of firesetting using crime scene classification techniques. The FBI approach drew on professional expertise and experience rather than any specific methodological or analytical techniques (Davis & Bennett, 2016; Gannon & Pina, 2010). Typologies were published as part of the FBI's larger Crime Classification Manual (Douglas et al., 1992; 2006; 2013). Within the Crime Classification Manual, firesetting is divided into two overarching categories: *organized* or *disorganized*. *Organized* firesetting is represented by elaborate use of incendiary devices, a low level of physical evidence, and factors demonstrating a methodological approach (e.g., multiple seats of ignition, excessive accelerant use). In comparison, *disorganized* firesetting is reflected by the use of on hand materials, common ignition sources and accelerants (e.g., matches, cigarettes, lighter fluid and gasoline), and physical evidence left behind at the scene.

Within this classification framework, multiple types of firesetting individuals are then proposed (including subtypes) based on the features of the fire (e.g., target, location, manner of ignition, materials and structure used), basic characteristics, and behavioural motivations. The motivational categories in the Crime Classification Manual include: *vandalism* (subtypes: wilful and malicious, peer group pressure, and mischief), *revenge* (subtypes: intimidation and personal, societal, group, or institutional retaliation), *excitement* (subtypes: thrill seeker, attention seeker, recognition, and sexual perversion), *profit* (subtypes: fraud and employment, parcel clearance and competition), *crime concealment* (subtypes: murder, suicide, breaking and entering, embezzlement, larceny, and destroying records), and

extremism (subtypes: terrorism, discrimination, and riots/civil unrest). For each subtype, details of likely victimology (e.g., targets), crime scene indicators, common forensic findings, and perpetrator characteristics are provided, and an example case study are provided to aid investigators with classifying cases.

Behavioural facet models. Canter and Fritzon (1998) adopted a more theoretically informed and methodologically rigorous approach for classifying firesetting. Canter and Fritzon (1998) integrated action systems theory (Shye, 1985), facet theory (Canter, 1985) and multidimensional scaling (MDS) methods to develop a general model of offending behaviour labelled the faceted behavioural action systems framework (FAST). The FAST framework views behaviour as part of a system, with prosocial behaviour reflecting functional systems and antisocial behaviour as dysfunctional systems. The FAST framework outlines four distinct modes of functioning based on the motivational source of the behaviour (internal or external) and the target (internal or external). Internally oriented motivations are categorised as having an expressive function (i.e., arising from the need to express emotions) and externally oriented motivations as having an instrumental function (i.e., direct objective of achieving a particular goal). Internally focused targets are described as those which are part of the person's personal or social identity (e.g., themselves or another person) whereas external targets refer to objects that the person does not have a personal affiliation with (Canter & Fritzon, 1998). The resulting typology represents the four combinations of motivational source and target and are labelled: *expressive* (internal source, external target), *integrative* (internal source, internal target), *adaptive* (external source, external target), and *conservative* (external source, internal target).

Canter and Fritzon (1998) applied the FAST framework to deliberate firesetting using a sample of 175 solved arson cases obtained from UK police forces. Data was extracted from files across 65 variables including offence variables (e.g., location target, indicators of

planning, time of offence, distance travelled), victim factors (e.g., relationship or prior contact with victim, whether lives were endangered), perpetrator offence history (e.g., previous convictions), and perpetrator demographics (e.g., age, sex, ethnicity, qualifications, employment status, mental health, substance use). Using content analysis and MDS, Canter and Fritzon (1998) found evidence for the four modes of functioning within the FAST framework. Modelling including perpetrator characteristics revealed four subtypes of firesetting that corresponded with the four modes of the FAST framework: *young offender* (adaptive mode; youth, firesetting opportunistic, antisocial goals, set fires to various objects), *repeat arsonist* (expressive mode; serial firesetting, emotional and social difficulties, target public building, fire positively reinforcing), *psychiatric history* (integrative mode; mental health issues, history of psychiatric treatment, targets themselves/own property, firesetting a cry for help or suicide attempt) and *failed relationship* (conservative mode; relationship problems, targeted known others as a form of revenge, use of accelerants and multiple seats of fire). Evidence for these four modes of functioning have also been found in other firesetting samples including police cases (Fritzon et al., 2001; Häkkänen et al., 2004), prison samples (Almond et al., 2005), and female mental health samples (Miller & Fritzon, 2007), as well as across a range of other problem behaviours (e.g., terrorism, homicide, genocide, crisis incidents, and self-harm) (Fritzon & Brun, 2005; Fritzon et al., 2001; Hempenstall & Hammond, 2018; Hollows & Fritzon, 2012; Miller & Fritzon, 2007).

Serial arson models. An alternative typology using crime scene characteristics was proposed by Kocsis and Cooksey (2002). Kocsis and Cooksey's typology was developed from analysis of 148 cases of serial arson (i.e., 3 or more incidents) obtained from police reports in New South Wales and Victoria in Australia. Fifty-six data points were extracted from case files including biographic and demographic characteristics of the perpetrator and crime scene indicators. Using MDS and cluster analysis, Kocsis and Cooksey identified

common behaviours across the cases (e.g., planning, leaving evidence, relationship with victim, theft) as well as four subtypes of serial firesetting: *thrill* (e.g., sporadic firesetting, intoxicated, fascination with fire), *anger* (e.g., rage, fires targeted at residential properties or cars, intended personal harm), *wanton* (e.g., general animosity, various targets, previous offending history) and *sexual* (e.g., target public facilities, evidence of sexual activity at the scene of the crime). Davis and Bennett (2016) comment that several of the typologies identified in the Serial Arson Model share similarities with the FAST framework (Canter & Fritzon, 1998), with the exception of the *sexual* subtype. However, Davis and Bennett note that the data pattern for the *sexual* subtype is closely aligned with the *thrill* subtype and suggest that it potentially could be a subgroup of the *thrill* type, similar to its conceptualisation in other classification systems (e.g., FBI Crime Classification Manual approach). However, this has not been further explored.

Crime scene classification approaches have significantly advanced the classification of firesetting, with the latest models (e.g., behavioural facet and serial arson models) integrating theory, research, investigative expertise, and deductive empirical techniques. Another notable strength of these approaches is that they integrate behavioural, motivational, and individual factors to generate subtypes based on theoretically and empirically informed categories which are relatively discrete in nature. As a result, the descriptions of categories within the classification systems are richer than the motivation-based typologies discussed earlier and do not solely rely on a single defining factor. Whilst the FBI Crime Classification Approach lacks empirical validation, the FAST framework has been rigorously evaluated and the Serial Arson Model identified categories with shared similarities to that of the FAST framework, suggesting the model holds up across different samples. Further, the idea of behaviour operating within functional and dysfunctional systems enables the framework to be applied to both prosocial and antisocial behaviour (i.e., it is not offence specific) and

hypotheses to be made about how firesetting may operate within this. That said, there are several weaknesses associated with crime scene classification systems that limit their utility for developing mechanistic explanations. First, the primary purpose of this approach is to guide criminal investigation, not guide explanation. As a result the aetiology of firesetting and the underlying mechanisms for this behaviour are not explained nor is it clear how the different categories within the subtypes (e.g., functioning and offence characteristics) interact to create an incident of firesetting as opposed to another type of dysfunctional behaviour. Finally, the level of explanation offered is limited due to the overemphasis of proximal motivations (the weaknesses of which have already been discussed) and crime scene factors within the model, with a distinct absence of psychological factors.

Statistically derived classification systems

In other areas of offending, typologies derived using statistical analysis, in particular clustering techniques (e.g., cluster analysis, MDS, factor analysis) have proved popular. However, this approach represents a relatively recent development in the firesetting literature. Empirically derived classification systems utilise a similar approach to crime scene classification systems. However, instead of primarily focusing on crime scene and offence information, they often develop profiles using psychometric assessment and/or detailed file information about those who have offended.

The first statistically derived typology of firesetting was developed by Harris and Rice (1996), using a sample of 243 adults admitted to a maximum-security psychiatric hospital. Harris and Rice collected variables of interest from patient clinical files. These variables were determined based on their use in previous theoretical and empirical research in the area and included: level of childhood and adult aggression, school adjustment, length of time with parents, number of admissions to corrections and criminal charges, IQ, length of employment, childhood firesetting, total number of fires, and motives for index fires (coded

as anger/revenge, psychotic/delusional, excitement/release of tension, and attention seeking).

Using correlational and cluster analysis techniques, Harris and Rice identified four subtypes

of firesetting based on the eleven variables included in the cluster analysis. They also

examined differences between the four subtypes on a further 30 variables not included in the

original cluster analysis (e.g., psychiatric information, index fire variables, and relationship

information). The four subtypes were labelled: *psychotics* (e.g., motivations primarily

delusional, diagnosis of schizophrenia, little history of firesetting or other antisocial

bejaviour, no alcohol issues, not unassertive), *unassertives* (e.g., least likely to have a

criminal history, best family backgrounds, higher IQ's, best employment history, least

assertive, motives of anger or revenge) *multi-firesetters* (e.g., poor developmental

background, high levels of aggression, set multiple fires, lowest IQ, history of psychiatric

contact, very unassertive, motives of anger, revenge, excitement of attention seeking) and

criminals (e.g., extensive criminal histories, difficult developmental backgrounds, diagnosis

of personality disorder, target strangers, no specific motives identified) . Harris and Rice also

examined the reoffending rates of each subtype using police data and institutional records.

The *unassertives* were least likely to reoffend, the *multi-firesetters* were the most likely to

reoffend, and the *criminals* were most likely to reoffend violently or using fire.

Green et al. (2014) used similar methods to classify their sample of 59 insanity

acquittees from one Australian state. Information was collected from case files including:

demographic, clinical, offence related and motivational variables. Cluster-analysis based on

21 variables, including psychiatric symptoms, motivation, fire-related and historical factors,

suggested a three cluster solution as the best fit. The three clusters could be distinguished as:

angry/antisocial (e.g., criminal history, revenge motive and proximal trigger), *spree*

firesetters (e.g., more than one index fire, stranger victim and no clear motive), and

persecuted suicidal (e.g., fire set at residence, remained at the scene, persecutory delusions, sub-cluster of suicidal behaviour and depressed symptoms).

Nanayakkara and colleagues adopted a slightly different approach to subtyping firesetting. Nanayakkara and colleagues used statistical classification methods to explore gender differences in firesetting (Nanayakkara et al., 2020a) as well as subtypes represented among those who have set high consequence fires (Nanayakkara et al., 2020b). Unlike previous statistical classification approaches, these studies examined types of firesetting within these two under-researched sub-groups, with the aim to inform clinical formulation and risk assessment. In both studies, Nanayakkara et al. collected data on individual factors (e.g., demographics, history of trauma, psychopathology), situational factors (e.g., living circumstances, legal circumstances, and mental health needs, interpersonal factors, and victim factors), and behavioural factors (e.g., targets, ignition behaviours and motivations). These variables were drawn from those utilised in crime scene classification research (e.g., Canter & Fritzon ,1998; Douglas et al., 1992), as well as potential criminogenic needs identified in the wider firesetting and risk assessment literature.

For their study on gender differences, Nanayakkara et al. (2020a) collected data for 96 firesetting adults (32 female, 64 male) from file information held by the New South Wales Coroner's Court and two Community Forensic Mental Health Services (CFMHS) in Australia. MDS techniques were used to examine the relationship between 45 variables. Based on the statistical relationship between the variables, Nanayakkara et al. (2020a) identified three types of firesetting within the sample that distinguished males and females: *dysregulated type (female)*, *intimate partner violence type (male)*, and *instrumental gain type (male)*. The *dysregulated type* reflected women who had a diagnosis of personality disorder, symptoms of mood disorder, engaged in self-harm and repeat firesetting, targeted their own homes, remained at the scene, and were motivated by suicide and frustration. The *intimate*

partner violence type differentiated males who targeted their ex-intimate partner, were triggered by feelings of interpersonal dispute and revenge, planned their firesetting, used accelerants, and engaged in ex-intimate stalking. *The instrumental gain type* represented males who caused high levels of damage and whose firesetting occurred in the context of another crime. These individuals were motivated by profit and were intoxicated at the time of the fire. They planned their offending, used accelerants, targeted a specific property and involved co-offenders.

In their study of subtypes of high consequence firesetting, Nanayakkara et al. (2020b) examined Coroner's report files for the State of New South Wales (NSW) for fires between 2000 and 2012 (*n* = 114 perpetrators). MDS analysis was conducted using 41 variables. Four clusters or types of high consequence firesetting were identified: *intimate partner violence type*, *vandalism type*, *fire interest type*, *instrumental gain type*, and *hopeless endangerment type*. The *intimate partner violence* and *instrumental gain types* identified in the high-consequence study appear similar to those identified in the gender study. The *vandalism type* represented individuals who were under 18 years of age, set fires with co-offenders, targeted schools and set fires in the context of 'another crime' (e.g., breaking and entering or vandalism). The *fire interest type* was characterised by the motive of 'excitement' seeking, fires set to vegetation, and remaining at the scene. Finally, the *hopeless endangerment type* included individuals who were motivated by symptoms of major mental illness and suicide and had an 'intent on life'. This subtype stayed at the scene of the fire and injury/death was a consequence of the firesetting.

Statistical methods offer an intuitively appealing approach for classifying firesetting, enabling a number of theoretically and empirically relevant factors to be objectively grouped together according to their occurrence or relationship in the data. Such methods allow for a large number of variables to be studied and for those of particular differentiating importance

to be identified through analysis, rather than these being rationally driven (e.g., like the FBI classification manual). The resulting categories also contain multiple discrete units by which to classify firesetting individuals However, a major weakness of statistical classification is its reliance on correlational rather than causal factors, limiting the classification systems' ability to explain behaviour (e.g., how factors within the subtypes relate to each other). They are also reliant on the type of data collected and how this is coded. For example, all four statistical classification systems utilise highly selective samples, with the majority focusing on case information for individuals with mental health needs. Further, due to the different methods and variables included it is difficult to compare the subtypes identified across studies.

Theory-based classifications

Advancements in classifying firesetting have arguably been hampered by the narrow focus of extant literature, which has predominantly focused on identifying motives and characteristics of those who set fires. This has resulted in a lack of focus in developing unified theories to explain deliberate firesetting (see Gannon & Pina, 2010). In recent years, there has been a revival in the literature and increased attention paid to developing theoretical explanations of firesetting. Many of these approaches have recognised the importance of classification within these and represent multi-modal frameworks that incorporate aetiological explanation and typological approaches. Two main methods have been used to develop theories and typologies in this way, aetiological pathway approaches and pluralistic approaches.

Aetiological pathways

A distinct limitation of motive-based, crime scene, and statistical classification systems is their inability to explain the aetiology of deliberate firesetting. Aetiological pathway models represent a recent development in the firesetting literature. These data-driven models are developed to generate theory using qualitative research methods (e.g., grounded

theory) and provide a detailed descriptive account of the thoughts, feelings, events, and contextual factors leading up to and surrounding an incidence of offending. Following initial model construction participants are traced though the model to identify common subtypes or pathways to offending based on shared features in the offence process.

Two pathway models have been developed for deliberate firesetting, one for adult men and women with mental health difficulties (Tyler et al., 2014, Tyler & Gannon, 2017) and one for adult males in prison (Barnoux et al., 2015). Tyler et al. (2014) developed the first pathway model for deliberate firesetting with a sample of 23 men and women with a history of firesetting and a diagnosed mental illness. Within their model, Tyler et al. identified three common patterns or pathways to offending labelled: *fire interest-childhood mental health*, *no fire interest-adult mental health*, *fire interest-adult mental health*. The three pathways were distinguished by the development of fire-related factors in childhood (e.g., engagement in firesetting, an interest in fire, and/or a strong affective response to fire (positive or negative)), the onset of mental health issues (e.g., during childhood/adolescence, early adulthood, or proximal to the offence), level of planning of the fire, and whether they stayed to watch the fire or not. In a follow up study, Tyler and Gannon (2017) validated the three pathways with their original sample plus an additional sample of 13 adult males with a history of firesetting and a diagnosed mental illness recruited from a UK prison ($n = 36$ total sample). Participants could be classified into the three existing pathways with no new pathways to firesetting identified.

Barnoux et al. (2015) adopted a similar approach in developing their descriptive model of adult male firesetting (DMAF). The DMAF was developed from interviews with 38 adult males with a history of firesetting, recruited from prisons in England and Wales. Within the model, two distinct pathways to firesetting were identified: *approach* and *avoidant*. Individuals who followed the *approach* pathway demonstrated a pattern of externalising their

thoughts, feelings and behaviours; often using aggression or violence to meet their needs; were being characterised by difficult upbringings (e.g., abuse), patterns of antisocial behaviour in childhood and adulthood (e.g., aggression, offending), and early fire experiences or firesetting. Feelings of anger and instrumentally oriented motives (e.g., revenge, escape, protest) often underpinned firesetting, which was often planned with the intent of endangering life. The *avoidant* pathway comprised individuals with a tendency to suppress their thoughts, feelings, and needs; allowing grievances to build up resulting in an explosive outburst (e.g., firesetting) disproportionate to the triggering event. Individuals who followed the *avoidant* pathway were characterised by low levels of assertiveness and previous engagement in antisocial behaviours. They were also less likely to have discernible or positive developmental experiences with fire. Firesetting was often triggered by the need to solve a problem or communicate status and associated with feelings of fear or frustration. Further, firesetting tended to occur in situations where offending seemed necessary or there was an opportunity to offend.

A notable strength of aetiological pathway approaches is that they provide a data-driven approach to theory generation and explanation, providing detailed descriptions of how an incident of firesetting occurs by incorporating both distal and proximal factors (i.e., multiple properties), and outlining causal mechanisms (i.e., "seeds" of explanation). In addition, potential targets for prevention (i.e., interrupting the pathway) and intervention can be extrapolated from examining individuals' progression through the categories in the pathways. Despite these strengths, aetiological pathways models are limited to explaining single incidents of firesetting. In addition, the current models rely heavily on male samples with women and individuals with intellectual and developmental difficulties under-represented. It therefore may be that other pathways to firesetting exist which have not been tested within the current frameworks. Further exploration and testing of the models and their

pathways with different populations would provide further information on how discrete these classificatory categories are and how well they can explain repeat firesetting behaviours.

Pluralistic classification

Fineman's (1980; 1995) dynamic behaviour theory represents the first multifactor theory to have adopted a pluralistic approach to classification in the area of deliberate firesetting. Fineman's theory views firesetting as an interaction between dynamic historical factors that predispose the individual towards maladaptive behaviours (e.g., personality, individual characteristics, and past interpersonal dysfunction), environmental factors that both teach and reinforce firesetting as an acceptable behaviour (e.g., family and social circumstances, lack of supervision, lack of fire safety education, caregiver responses to previous fire behaviours) and immediate environmental conditions that support firesetting (e.g., triggering event, crisis or trauma; cognition and affect pre, during and post firesetting; external and internal reinforcers). Fineman suggests that assessing these various factors as part of a clinical interview can aid clinicians in developing a formulation of an individual's firesetting sequence.

To accompany his aetiological theory, Fineman (1980; 1995) proposed eight motive-based typologies of firesetting which were suggested to subsume those previously noted in the literature: *curiosity*, *accidental*, *cry for help* (i.e., interpersonal, intrapersonal, would be hero, firefighter setter), *delinquent/antisocial* (i.e., profit, crime concealment, vandalism, hate and revenge), *severely disturbed* (i.e., paranoid, psychotic, sensory reinforcement, pyromania and self-harm), *cognitively impaired (*i.e., organic impairment, foetal alcohol/drug syndrome, and learning disability) *socio-cultural* (i.e., religion, satanic, mass hysteria), and *wildland*. Fineman provided case examples for some of the typologies that included some of the key characteristics, aetiological features, and motivations for their firesetting. However, this level

of detail was not provided for all examples and the typologies do not appear to be distinguishable based on these factors; rather these are motive-based in their orientation.

Gannon et al. (2012) extended the initial steps made by Fineman in their Multi-Trajectory Theory of Adult Firesetting (M-TTAF). Using theory knitting (Kalmar & Sternberg, 1988), Gannon et al. integrated existing empirical and theoretical knowledge (including Fineman's theory) with new ideas and clinical expertise into a unified two-tiered multifactor theory of firesetting. Tier one of the M-TTAF theorises that key *developmental factors* and experiences occur during childhood (e.g., caregiver experiences, social functioning; the development of cognitive scripts, beliefs and attitudes about fire; biological and cultural factors) which create a set of *psychological vulnerabilities* (i.e., inappropriate interests, attitudes and associations with fire; fire scripts; attitudes supportive of offending; self/emotional-regulation issues; communication and relationship problems) which predispose individuals to firesetting. *Proximal factors and triggers* (i.e., life events; internal affect/cognition; cultural and biological influences) and *moderating factors* (i.e., mental health and self-esteem), interact with and reflect *psychological vulnerabilities*, priming them to become *critical risk factors*, increasing the risk of firesetting.

Tier two of the M-TTAF outlines five prototypical subtypes or trajectories to firesetting. Individuals are classified into the trajectories based on their unique pattern of characteristics (e.g., critical risk factors, potential clinical features, and motivators) within tier one. The five trajectories are labelled: *antisocial*, *grievance*, fire *interest*, *emotionally expressive/need for recognition*, and *multifaceted*. A summary of the factors that distinguish each subtype can be found in Table 3. However, to provide an example, individuals within the *grievance* trajectory are hypothesized to present with poor self-regulation particularly in relation to feelings of anger, hostility, and aggressive responding. Other likely risk factors include communication problems (e.g., poor interpersonal skills), anger rumination, and the

presence of cognitive scripts around the use of fire as a powerful vessel through which to send a warning or message. Likely motivators that are hypothesised to be associated with this trajectory are revenge and retribution.

[Insert Table 3 about here]

A key strength of pluralistic approaches is that they integrate both aetiological theory and typological knowledge of firesetting within the classification system. Whilst Fineman's work did not fully achieve this, the M-TTAF has advanced this approach, providing full and detailed descriptions of its trajectories. More specifically, the proposed typologies within the M-TTAF classify firesetting individuals based on mechanistic factors (e.g., likely risk factors), clinical features, and motivations; explaining the different paths people may take to firesetting. While the M-TTAF does not include aetiological features within the Tier 2 typologies, the development of clinical features and likely risk factors that form the basis of classification are explained within Tier 1. A second notable strength of the M-TTAF is the inclusion of hypothesised fire-specific factors (e.g., fire scripts, interests, attitudes and associations with fire) that offer both some level of explanation as to why people may choose to use fire in their offending over other methods and how this may differ across subtypes. This has led to other theoretical developments in the area and new avenues of inquiry including hypotheses around fire-specific cognitions (e.g., implicit theories; Ó Ciardha & Gannon, 2012) and additional fire scripts (Butler & Gannon, 2015), which have in turn been mapped to the different M-TTAF trajectories. Finally, research using statistical clustering techniques has reported emerging empirical support for some of the trajectories in samples of apprehended firesetting individuals (e.g., Dalhuisen et al., 2017; Nanayakkara et al., 2020a, 2020b).

Although pluralistic approaches, particularly the M-TTAF, have several clear strengths, the proposed typologies do have their limitations. First, the overall theoretical

framework and associated typologies are reliant on the existing literature, which as noted previously has been narrow in focus and slow to develop. It is therefore likely that the M-TTAF may need to be revised as new knowledge is generated. Second, whilst empirical evidence is beginning to emerge for some of the trajectories, there is suggestion that not all firesetting individuals fit these, that other trajectories exist, or that some may require further refining (e.g., Dalhuisen et al., 2017; Hagenauw et al., 2015; Nanayakkara et al., 2020a, 2020b). However, none of these studies have directly assessed the defining categories of the trajectories (e.g., risk factors and clinical features). Rigorous empirical research is required using measures that directly assess the critical risk factors, clinical features, and motivators that are hypothesised to define the M-TTAF trajectories, to further understand how well these classify firesetting individuals and whether the subtypes represent discrete groupings.

Conclusions and future directions for the classification of firesetting

In summary, classification has proved highly popular for informing explanation of deliberate firesetting. However, the literature appears to have lacked direction as to how to improve and develop classification systems, with many using similar defining constructs. As a result, many of the approaches reviewed are plagued by similar issues which has arguably hampered knowledge development in the field. Having reviewed the literature on existing approaches for classifying firesetting. We now make several suggestions as to how future theoretical and empirical research may approach the classification of firesetting to further explanation and clinical practice with individuals who have set fires.

One clear feature of classification systems for firesetting is their concentration on fire use as a problematic and dangerous behaviour. The continued use of highly selective samples (e.g., those detected by authorities for firesetting) arguably reinforces this perspective and limits the way in which firesetting is viewed and classified. Developing an understanding of why some individuals use fire in a harmful way and others do not is important for advancing

theory and classification of this behaviour. Humans' dual relationship with fire, both as "friend and foe", is well documented throughout history; with human cultures throughout the world having harnessed its powers for both survival (e.g., cooking, warmth) and destructive purposes (e.g., causing damage or harm) (Jensen, 2016). Depending on the individual's underlying function or goals, fire use may be considered as an adaptive or maladaptive behaviour, legal or illegal, or prosocial or harmful. Fire use and firesetting is therefore likely to occur along a continuum from 'normative' to 'problematic'. Developmental experiences are likely to influence how individuals think, feel and behave around fire and how and when they use it (as hypothesised in the M-TTAF). Therefore, classification would benefit from integrating theoretical perspectives about fire use along this continuum, and incorporating potential differentiating factors (e.g., fire-specific attitudes, interests, and cognitions) as underlying units. Whilst there is some preliminary theory in this area (e.g., Butler & Gannon, 2015; Ó Ciardha & Gannon, 2012) the hypothesized constructs (e.g., implicit theories, scripts, and expertise) require further empirical investigation with both those who use fire in a functional and in a dysfunctional way.

Further, as noted by Fineman (1980) "there are difficulties inherent in assuming that any given sample of [firesetting individuals] is representative of [firesetting] in general, especially when it is apparent that most [of those who set fires] are not apprehended" (p. 486). An emerging body of research suggests that there are subtle differences in the individual and motivational features of un-apprehended firesetting individuals (e.g., Barrowcliffe & Gannon, 2015, 2016). Therefore, a good classification system should seek to account for firesetting by both those who are detected and those who go undetected for this behaviour.

Finally, unlike other areas of offending behaviour (e.g., sexual offending, intimate partner violence), typologies for firesetting have, as yet, to be used to inform risk assessment,

intervention development, and treatment allocation for deliberate firesetting (Horley &

Bowlby, 2011). This is probably a good thing, as classification approaches have as yet to

develop into systems which can meaningfully inform formulation, risk management and

treatment, and there is a distinct lack of research on treatment outcomes and risk factors

associated with firesetting. Multi-modal approaches such as the M-TTAF offer promise,

however, they require further validation to ascertain how well the sub-categories

accommodate different samples of firesetting individuals with differing needs. For

classification systems to (a) meaningfully aid explanation of firesetting and (b) provide a

helpful guide for risk assessment and treatment planning, further theoretical and empirical

research is urgently needed.

References

Almond, L., Duggan, L., Shine, J., & Canter, D. (2005). Test of the arson action system model in an incarcerated population. *Psychology, Crime and Law*, 11(1), 1-15. doi: 10.1080/1068316031009634287

Barker, A.F. (1994). *Arson: A review of the psychiatric literature*. Oxford University Press.

Barnoux, M., Gannon, T.A., & Ó Ciardha, C. (2015). A descriptive model of the offence chain for imprisoned adult male firesetters. *Legal and Criminological Psychology*, 20(1), 48-67. doi:10.1111/lcrp.12071

Barrowcliffe, E.R., & Gannon, T.A. (2015). The characteristics of un-apprehended firesetters living in the UK community. *Psychology, Crime and Law*, 21(9), 836-853. doi: 10.1080/1068316X.2015.1054385

Barrowcliffe, E.R., & Gannon, T.A. (2016). Comparing the psychological characteristics of un-apprehended firesetters and non-firesetters living in the UK. *Psychology, Crime and Law*, 22(4), 382-404. doi:10.1080/1068316X.2015.1111365

Bradford, J.M.W. (1982). Arson: A clinical study. *Canadian Journal of Psychiatry, 27*, 3, 188 - 193. doi:10.1177/070674378202700302

Butler, H., & Gannon, T.A. (2015). The scripts and expertise of firesetters: a preliminary conceptualisation. *Aggression and Violent Behavior*, 20, 72-81. doi: 10.1016/j.avb.2014.12.011

Campbell, R. (2017). *Intentional Fires*. National Fire Protection Association. Retrieved from http://www.nfpa.org/news-and-research/fire-statistics-and-reports/fire-statistics/fire-causes/arson-and-juvenile-firesetting/intentional-fires

Canter, D., & Fritzon, K. (1998). Differentiating arsonists: a model of firesetting actions and characteristics. *Legal and Criminological Psychology*, 3, 73-96. doi:10.1111/j.2044-8333.1998.tb00352.x

Dalhuisen, L., Koenraadt, F., & Liem, M. (2017). Subtypes of firesetters. *Criminal Behaviour and Mental Health*, 27, 59-75. doi:10.1002/cbm.1984

Davis, M.R., & Bennett, D. (2016). Future directions for criminal behaviour analysis of deliberately set fire events. In R.M. Doley, G.L. Dickens, & T.A. Gannon (Eds.) *The Psychology of Arson: A Practical Guide to Understanding and Managing Deliberate Firesetters*. (pp. 131-146). Routledge.

Dickens, G.L., & Sugarman, P.A. (2012). Differentiating firesetters: lessons from the literature on motivation and dangerousness. In G.L. Dickens, P.A. Sugarman, & T.A. Gannon (Eds.) *Firesetting and mental health*. (pp. 48-67). RCPsych.

Doley, R. (2003). Making sense of arson through classification. *Psychiatry, Psychology and Law*, 10(2), 346-352. doi:10.1375/pplt.2003.10.2.346

Douglas, J.E, Burgess, A.W, Burgess, A.G, & Ressler, R.K. (1992). *Crime classification manual: a standard system for investigating and classifying violent crimes*. Lexington Books.

Douglas, J.E, Burgess, A.W, Ressler, R.K, & Burgess, A.G. (2013). *Crime classification manual: a standard system for investigating and classifying violent crimes* (3rd Edition). Wiley.

Faulk, M. (1988). *Basic Forensic Psychiatry*. Oxford: Blackwell Scientific.

Fineman, K. R. (1980). Firesetting in childhood and adolescence. *Psychiatric Clinics of North America*, 3, 483−499.

Fineman, K. R. (1995). A model for the qualitative analysis of child and adult fire deviant behavior. *American Journal of Forensic Psychology*, 13, 31−60.

Fritzon, K. (2012). Theories on arson: the action systems model. In G.L. Dickens, P.A. Sugarman, & T.A. (Eds.). *Firesetting and Mental Health*. (pp. 28 – 47). RCPsych.

Fritzon, K., & Brun, A. (2005). Beyond columbine: a faceted model of school-associated homicide. *Psychology, Crime and Law*, 11(1), 53-71. doi: 10.1080/1068316042000209314

Fritzon, K., Canter, D., & Wilton, Z. (2001). The application of an action system model to destructive behaviour: the examples of arson and terrorism. *Behavioral Sciences and the Law*, 19, 657-690. doi:10.1002/bsl.464

Gannon, T.A., Ó Ciardha, C., Doley, R.M., & Alleyne, E. (2012). The multi-trajectory theory of adult firesetting (M-TTAF). *Aggression and Violent Behavior*, 17, 107-121. doi: 10.1016/j.avb.2011.08.001

Geller, J.L. (1992). Arson in review: from profit to pathology. *Psychiatric Clinics of North America*, 15(3), 623-645. doi: 10.1016/S0193-953X(18)30228-4

Hagenauw, L.A., Karsten, J., Akkerman-Bouwsema, G.J., de Jager, B.E., & Lancel, M. (2015). Specific risk factors of arsonsits in a forensic psychiatric hospital. *International Journal of Offender Therapy and Comparative Criminology*, 59(7), 685-700. doi:10.1177/0306624x13519744

Häkkänen, H., Puolakka, P., & Santtila, P. (2004). Crime scene actions and offender characteristics in arsons. *Legal and Criminological Psychology*, 9, 197-214. doi: 10.1348/1355325041719392

Harris, G.T., & Rice, M.E. (1996). A typology of mentally disordered firesetters. *Journal of Interpersonal Violence*, 11(3), 351-363. doi:10.1177/088626096011003003

Hempenstall, L., & Hammond, S. (2018). Differentiating crisis incidents: a replication study using the action systems model. *Journal of Investigative Psychology and Offender Profiling*, 15(2), 162-174. doi:10.1002/jip.1498

Hollows, K., & Fritzon, F. (2012). "Ordinary men" or "evil monsters"? an action systems model of genocidal actions and characteristics of perpetrators. *Law and Human Behavior*, 36(5), 458-467. doi:10.1037/h0093987

Home Office (2017). *Fire Statistics: Deliberate fires attended.* Retrieved from https://www.gov.uk/government/statistical-data-sets/fire-statistics-data-tables#deliberate-fires

Horley, J., & Bowlby, D. (2011). Theory, research and intervention with arsonists. *Aggression and Violent Behavior*, 16, 241-249. doi:10.1016/j.avb.2011.03.006

Icove, D.J., & Estepp, M.H. (1987). Motive-based offender profiles of arson and fire-related crimes. *FBI Law Enforcement Bulletin*, 56(4),17-23.

Inciardi, J.A. (1970). The adult firesetter: A typology. *Criminology,* 8, 145-155. doi: 10.1111/j.1745-9125.1970.tb00736.x

Jensen, E. (2016). *Ancient fire modern fire*. Pixyjack Press.

Kalmar, D., & Sternberg, R. (1988). Theory knitting: An integrative approach to theory development. *Philosophical Psychology*, 1(2), 153–170. doi:10.1080/09515088808572934

Kocsis, R.N., & Cooksey, R.W. (2002). Criminal psychological profiling of serial arson crimes. *International Journal of Offender Therapy and Comparative Criminology*, 46(6), 631-656. doi:10.1177/0306624X02238159

Koson, D. F., & Dvoskin, J. (1982). Arson: A diagnostic study. *Bulletin of the American Academy of Psychiatry and the Law*, 10, 39−49.

Levin, B. (1976). Psychological characteristics of firesetters. *Fire Journal*, 70, 36−41.

Lewis, N. O. C., & Yarnell, H. (1951). Pathological firesetting (pyromania). *Nervous and mental disease monograph*, Vol. 82, Coolidge Foundation.

Miller, S., & Fritzon, K. (2007). Functional consistency across two behavioural modalities: fire-setting and self-harm in female special hospital patients. *Criminal Behaviour and Mental Health*, 17(1), 31-44. doi:10.1002/cbm.637

Nanayakkara, V., Ogloff, J.R.P., Davis, M.R., & McEwan, T.E. (2020a). Gender-based types of firesetting: clinical, behavioural, and motivational, differences among male and female firesetters. *Journal of Forensic Psychiatry and Psychology*. doi: 10.1080/14789949.2020.1720266

Nanyakkara, V., Ogloff, J.R.P., McEwan, T.E., & Davis, M.R. (2020b). Applying classification methodology to high consequence firesetting. *Psychology, Crime and Law*. doi:10.1080/1068316X.2020.1733568

Ó Ciardha, C., & Gannon, T.A. (2012). The implicit theories of firesetters: a preliminary conceptualisation. *Aggression and Violent Behavior*, 17(2), 122-128. doi: 10.1016/j.avb.2011.12.001

Prins, H. (1994). *Fire-raising: Its motivation and management*. London: Routledge.

Prins, H., Tennent, G., & Trick, K. (1985). Motives for arson (fire raising). *Medicine, Science and the Law*, 25, 275−278.

Puri, B.K., Baxter, R., & Cordess. (1995). Characteristics of fire-setters: a study and proposed multiaxial psychiatric classification. *British Journal of Psychiatry*, 166, 393-396. doi: 10.1192/bjp.166.3.393

Rider, A. O. (1980). The firesetter: a psychological profile (part 1). *FBI Law Enforcement Bulletin*, 49, 6−13.

Rix, K. J. B. (1994). A psychiatric study of adult arsonists. *Medicine Science and Law*, 34, 21−34. doi:10.1177/002580249403400104

Smith, R.G., Jorna, P., Sweeney, J, & Fuller, G. (2014). *Counting the costs of crime in Australia: A 2011 estimate*. Australian Institute of Criminology: Research and public

Policy Series 129. Canberra. Retrieved from

http://www.aic.gov.au/media_library/publications/rpp/129/rpp129.pdf

Stone, J.H., Roberts, M., O'Grady, J., Taylor, A.V., & O'Shea, K. (2000). *Faulk's Basic Forensic Psychiatry*, 3rd edition, Blackwell Science.

Tyler, N., Gannon, T.A., Lockerbie, L., King, T., Dickens, G.L., & De Burca, C. (2014). A firesetting offence chain for mentally disordered offenders. *Criminal Justice and Behavior*, 41(4), 512-530. doi:10.1177/0093854813510911

Tyler, N., & Gannon, T.A. (2017). Pathways to firesetting for mentally disordered offenders: a preliminary examination. *International Journal of Offender Therapy and Comparative Criminology*, 61(8), 938-955. doi:10.1177/0306624X15611127

Vreeland, R., & Levin, B. (1980). Psychological aspects of firesetting. In D. Canter (Ed.), *Fires and human behaviour*. Wiley. Pp.31-46.

Ward, T., & Carter, E. (2019). The classification of offending and crime related problems: a functional perspective. *Psychology, Crime and Law*, 25(6), 542-560. doi: 10.1080/1068316X.2018.1557182

Table 1: Overview of classification systems for deliberate firesetting

Classification Type	Studies
Atheoretical Classifications	
Unilateral systems	Bradford (1982); Icove & Estepp (1987); Inciardi (1970); Lewis & Yarnell (1951); Prins et al. (1985); Prins (1994); Puri et al., 1995; Ravataheino (1989); Rix (1994)
Dichotomous or tripartite systems	Barker (1994); Faulk (1988; 2000); Levin (1976); Scott (1974); Vreeland & Levin (1980)
Crime scene classification systems	Almond et al. (2005); Canter & Fritzon (1998); Fritzon et al. (2001); Fritzon et al. (2014); Kocsis & Cooksey, 2002; Miller & Fritzon (2007)
Statistically derived systems	Harris & Rice (1996); Green et al. (2014); Nanayakkara et al. (2020a); Nanayakkara et al. (2020b)
Theory-Based Classifications	
Aetiological pathways	Barnoux et al. (2015); Tyler et al., (2014); Tyler & Gannon (2017)
Pluralistic classification	Fineman (1995); Gannon et al. (2012)

Table 2: Overview of motivation-based typologies for firesetting – in order of publication

Authors	Sample	Subtypes
Lewis & Yarnell (1951)	2000 case files from the National Board of Fire Underwriters in the USA, as well as cases from various fire marshals and psychiatric services	Accidental or unintentional, delusional, erotic, revenge-spite, children
Inciardi (1970)	138 case files for paroled adults with an arson offence from New York State Prisons	Revenge, excitement, insurance-claim, vandalism, and crime concealment
Bradford (1982)	34 files of individuals charged with arson referred to the Royal Ottawa Satate Hospital in Canada	Accidental, psychotic (delusional), revenge, sexual gratification (erotic), attention seeking/cry for help, professional, children, and mixed
Prins et al. (1985); Prins (1994)	113 individuals imprisoned for arson offences	Financial reward, crime concealment, political purposes, self-immolation, mixed motives, mental disorder, impaired cognitive functioning, revenge, attention seeking, young adults (vandalistic), children
Icove & Estepp (1987)	Interviews with 1,016 young people and adults arrested for arson and fire-related offences by the Fire Prevention Bureau in the USA	Vandalism, excitement, revenge, crime concealment, and profit

Ravataheino (1989)	180 individuals arrested for an arson offence in Helsinki, Finland.	Insurance fraud, revenge (including jealousy, hatred, envy, grudge), sensation, alcoholic and mental patients and the 'temporarily disturbed', vandalism, pyromaniacs, children under 15
Rix (1994)	153 adults referred for pre-trial psychiatric assessment	Revenge, excitement, vandalism, cry for help/attention, re-housing, attempted suicide, carelessness, psychotic, financial, cover-up, other manipulative, heroism, proxy, antidepressant, political
Puri et al. (1995)	File review of 36 patients referred to the West Thames Forensic Psychiatry Service between 1987-1991	Burglary, pleasure from fire, revenge, rejection, substance misuse, psychosis, depression, accidental

Table 3: Summary of the subtypes hypothesised within the M-TTAF (Gannon et al., 2012)

Trajectory	Prominent Risk Factor	Other Likely Risk Factors	Potential Clinical Features	Potential Motivators
Antisocial	Offense-Supportive Attitudes/Values (supporting general criminality)	Self-regulation Issues (e.g., poor emotional modulation)	Antisocial Values/Attitudes Impulsivity Conduct Disorder or Antisocial Personality Disorder	Vandalism/Boredom Crime Concealment Profit Revenge/Retribution
Grievance	Self-Regulation Issues	Communication Problems Inappropriate Fire Script	Low Assertiveness Poor Communication Fire-Aggression Fusion Script Anger (rumination) Hostility	Revenge/Retribution
Fire Interest	Inappropriate Fire Interest/Scripts	Offense-Supportive Attitudes (supporting firesetting)	Fire Fascination/Interest Impulsivity Attitudes Supporting Fire	Fire Interest/Thrill Stress/Boredom
Emotionally Expressive/Need for Recognition	Communication Problems	Self-regulation Issues* (e.g., poor emotional modulation)	Poor Communication Impulsivity Depression Fire-Coping Fusion Script Personality Traits/Disorder	Cry for Help* Self-Harm* Suicide* Need for Recognition
Multi-Faceted	Offense-Supportive Attitudes/Values (supporting general criminality and firesetting) Inappropriate Fire Interest/Scripts	Self-regulation Issues Communication Problems	Pervasive Firesetting/ General Criminal Behavior Fire Fascination/Interest Antisocial Values/Attitudes Conduct Disorder or Antisocial Personality Disorder	Various

* = Emotionally expressive subtype only

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