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Mentally Disordered Firesetters: An Examination of Risk Factors

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Abstract

Objective: In this study, we examined the risk-related characteristics of mentally disordered patients who had either been (1) involved in a firesetting incident, or (2) involved in a non-firesetting comparison incident whilst under the care of the National Health Service. Method: One hundred and thirty-two participants were recruited within an NHS Care Group in England (66 mentally disordered firesetters, 66 mentally disordered comparisons). Logistic regression was used to model the ability of static, dynamic, and incident-related factors in predicting whether or not a patient had set a fire (including gender-sensitive sub-analyses), and whether a patient firesetter was male or female, or a one-time or repeat firesetter. Results: We identified a cluster of variables that predicted firesetting status. We also identified key factors that predicted female patient firesetters relative to female patient controls who engaged in other undesirable behaviours and male patient firesetters. A cluster of variables predictive of repeat versus one-time firesetting also emerged. Conclusions: Findings are discussed in relation to further development of risk-related firesetting theory.

Key Words: *mental disorder, firesetting, risk, forensic mental health, National Health Service*

Mentally Disordered Firesetters: An Examination of Risk Factors

Approximately 10% of patients in secure mental health institutions hold a conviction for deliberate firesetting (Dickens & Doyle, 2016). Yet, there is no specialised risk assessment to aid professionals in risk management decisions with these individuals. Instead, many professionals rely on violence risk assessments to bridge the gap (Historical Risk Clinical-20 V3, Douglas, Hart, Webster, & Belfrage, 2013). However, deliberate firesetting often originates from non-violent motivators (Gannon, Ó Ciardha, Doley, & Alleyne, 2012). Thus, violence risk assessments are unsuitable for widespread use with firesetters (McEwan, Doley, & Dolan, 2012).

Risk Assessment

The most 'practically useful' (Brown, Bowen, & Prescott, 2017) method of forensic risk assessment combines historical, unchangeable static risk factors (such as criminal history) with fluctuating—yet treatable—dynamic risk factors (e.g., relationship problems or hostility). These risk factors are brought together using structured professional judgement to form an understanding about the relative likelihood of particular types of future behaviour (e.g., future violence, firesetting) and of what may contribute to a 'risk formulation' (Hart, Sturmey, Logan, & McMurran, 2011).

Theoretical and Research Indicators of Firesetting Risk

For years, no comprehensive theory was available to explain why adults with or without a mental disorder misuse fire. In 2012, Gannon and colleagues developed the *Multi-Trajectory Theory of Adult Firesetting* (or M-TAFF). Gannon et al. propose that individuals begin to misuse fire due to dynamic risk factors spanning four areas: *Fire Factors* (i.e., cognitive and emotional responses to fire), *Attitudes* (i.e., antisocial attitudes), *Social Effectiveness* (i.e., poor social skills, social isolation), and *Coping and Control* (i.e., emotion regulation problems, poor impulse control). Few gender differences are alluded to although

women are hypothesised to have impulsivity problems that result in 'cry for help', self-harm, or suicide fire misuse. Static risk factors are largely ignored and there is no focus on how firesetting characteristics (e.g., premeditation) might be associated with gender or firesetting maintenance.

Static risk and incident-related characteristics

Research examining risk in mentally disordered firesetters (MDFs) is scant. Studies suggest that male dominated samples of MDFs are characterised by negative developmental histories and higher prevalences of personality disorder diagnoses relative to non-firesetter mentally disordered offenders (Bradford, 1982; Hagenauw, Karsten, Akkerman-Bouwsema, de Jager & Lancel, 2014; Räsänen, Hakko & Väisänen, 1995). MDFs are also characterised by higher numbers of previous mental health service contacts/admissions (Ducat, Ogloff, & McEwan, 2013; Geller, Fisher, & Moynihan, 1992). When female MDFs have been examined, some differences have been reported. Dickens and colleagues (2007) found that female MDFs, relative to male MDFs, were more likely to have experienced past relationship difficulties, but less likely to have alcohol problems. Female MDFs were also less likely to have been intoxicated during their firesetting, and were more likely to set fires to attract attention or as 'parasuicide'. Enayati, Grann, Lubbe, and Fazel (2008) compared the psychiatric diagnoses of male and female MDFs in Sweden and found no distinctive gender patterns. More recently, however, Ducat, McEwan, and Ogloff (2017) reported that female firesetters in contact with the criminal justice system are more often diagnosed with disorders such as borderline personality disorder and substance misuse, relative to male firesetters.

Dynamic risk factors

Research has found that when compared to other mentally disordered offending groups, groups of male or mostly male MDFs are characterised by increased hostility

(Hagenauw et al., 2014; Rice & Harris, 1991), and alcohol misuse (Enayati et al., 2008; Labree, Mijman, van Marle, & Rassin, 2010; Räsänen et al., 1995). Additionally, active mental illness and social skills issues appear common (Bradford, 1982; Hagenauw et al., 2014; Räsänen et al, 1995).

Recent research suggests that male imprisoned firesetters—many of whom have mental health difficulties—self-report greater problems in their cognitive and emotional responses to fire (e.g., finding serious fires exciting) relative to matched non-firesetting offenders (Gannon et al., 2013). Dynamic risk factors common to mainstream offenders such as emotional-regulation problems (Craig, Dixon, & Gannon, 2013) have also been identified in male imprisoned firesetters (Gannon et al., 2013). Other work suggests female MDFs are characterised by impulsivity (Long, Fitzgerald, & Hollin, 2015) and emotion-regulation deficits that promote self-harm/suicide (Miller & Fritizon, 2007). Nevertheless, one study (see Tyler, Gannon, Dickens, & Lockerbie, 2015) comparing mostly male MDFs with mentally disordered non-firesetting offenders has shown that while MDFs have a more problematic emotional response to fire, other differentiating dynamic risk factors could not be identified.

Repeat firesetting

Very little is known about risk factors associated with repeat firesetting. Rice and Harris (1996) found that young age at first fire, low intelligence, and lack of aggression predicted repeat firesetting for male MDFs. Repeat MDFs also appear to have more convictions and have spent a greater time in prison relative to non-firesetting mentally disordered offenders (Dickens et al., 2009; Repo, Virkkunen, Rawlings, & Linnoila, 1997). Unsurprisingly, then, antisocial personality disorder appears predictive of repeat mentally disordered firesetting (Repo et al., 1997). Dynamic risk factors such as active symptoms of mental illness (particularly psychosis) also appear common amongst repeat MDFs relative to

one-time MDFs (Dickens et al., 2009; Repo et al., 1997). More recently, Tyler et al. (2015) found that MDFs exhibiting fire interest were most likely to have perpetrated multiple episodes of firesetting.

The Current Research

A key reason why understanding of MDFs remains limited is poor study design. Studies use male dominated samples and do not use control groups of other mentally disordered individuals who are meaningfully matched on key characteristics. Furthermore, few studies adequately compare female and male MDFs[1] or one-time and repeat firesetters. In this study, we draw upon specialist archived National Health Service (NHS) patient data files (N = 132) to identify the static, dynamic, and incident-related risk predictors for firesetting in mentally disordered individuals. Important questions key to developing empirically-based models of mentally disordered firesetting risk remain unanswered. These questions revolve around (a) whether predictors of firesetting are different to predictors of other undesirable behaviours, (b) whether male and female firesetting is characterised by different predictors, and (c) whether there are discernable risk factors for engaging in repetitive firesetting relative to one-time firesetting.

The data set is novel since it will allow us to match and compare mentally disordered individuals who have set fires during their time as an NHS patient with mentally disordered individuals who have never set a fire but who have perpetrated another undesirable incident whilst under NHS care. First, we compare the static, dynamic, and incident related risk factors associated with the firesetting or control incident to examine whether there are characteristics that differentiate MDFs from MDCs (including sub-analyses by gender).

[1] Although Ducat et al.'s (2017) recent published paper compares firesetters on characteristics of psychopathology, it does not specifically examine MDFs.

Then, we focus on the MDF group, examining whether static, dynamic, and incident-related characteristics differentiate male and female MDFs or one-time versus repeat MDFs.

Method

Design

This study was conducted according to APA ethical guidelines and was approved by the University's Research Ethics Committee (Ref: 20143546), London Fulham NHS REC (Ref: 14/LO/1060) and the NHS Confidentiality Advisory Group (14/CAG/1005). The study design was retrospective and involved pre-existing trust incident report forms from 3 January 2005 – 24 June 2014 to identify participants who had been either been (a) involved in a firesetting incident, or (b) involved in a non-firesetting comparison incident (e.g., drug taking, self-harm, violence).

Participants

One hundred and thirty-two participants were recruited within an English NHS Care Group (66 MDFs, 66 MDCs). Approval was sought under Regulation 5 of the Health Service (Control of Patient Information) Regulations 2002 to process patient identifiable information without prior informed consent. This regulation could be used since all patients admitted to trust care are provided with documentation informing them that their details will be used for research purposes unless they opt out.

MDFs. To be classified as a MDF, individuals needed to be: (1) under trust care for a psychiatric problem, and (2) the named perpetrator of a deliberate incident of firesetting with a trust incident form for the period 3 January 2005 to 24 June 2014. Participants' ages ranged from 18-71 years (M = 41.7 years, SD = 15.1) at the time of their firesetting and the majority identified themselves as White British (93.9%, n = 62). Overall, 60.6% (n = 40) were females

and the mean age of male and female MDFs was similar (*M*s = 40.8 years and 42.2 years respectively). Patients were distributed across inpatient/community services. Most were inpatients within a mental health unit[2] when the firesetting took place (71.2%, *n* = 47). The remainder were acute community mental health patients (i.e., early community intervention and crisis resolution; 28.8%, *n* = 19). MDFs were classified as repeat firesetters if their file records showed multiple incidents of intentional firesetting (regardless of formal convictions).

MDCs. The matched MDCs were: (1) under trust care for a psychiatric problem, and (2) the named perpetrator of a non-firesetting incident recorded within a trust incident form for the period 3 January 2005 to 24 June 2014. Incidents included violence, sexual abuse, absconsion, self-harm and drug taking. All available documentation was reviewed to ensure, as far as was possible, that MDCs did not have a history of firesetting. MDCs were matched to MDFs on gender, age (+/- five years), as well as inpatient/community service that the incident occurred within.

Procedure and Materials

First, pre-existing trust incident report forms were requested and reviewed by the first author electronically or in paper format. Each patient's case file differed regarding the number of records/reports within it and very few contained psychometric assessments. If the first author felt that a case file did not provide sufficient information for coding (e.g., if there was no documentation covering the month leading up to the index incident), then the file was replaced with a new patient case file until enough files with sufficient information where available for coding. MDFs' files were reviewed first so that a corresponding MDC file could be matched. Second, following a literature review, a basic checklist of characteristics was devised encompassing static, dynamic, and incident-related characteristics. File information

[2] This did not include prison healthcare.

reviewed included risk assessments, Mental Health Review Tribunal reports, psychological assessments, and nursing progress notes. Using the checklist, the first author determined whether each checklist factor was present using each patient's case file. In the case of dynamic risk, factors needed to be present in the month prior to the incident (firesetting or control) in order to be rated as present. For repeat firesetters, if multiple incidents of firesetting were apparent then the first incident was chosen for the coding of dynamic and incident risk factors. The checklist evolved substantially throughout the review. To promote the discovery of previously unrecorded dynamic risk factors, potentially risk-increasing characteristics found within the patient files were documented. Then, upon completion of the file reviews, all items were reviewed and collapsed as appropriate (e.g., 'poor sleep hygiene' and 'poor diet', were combined into a broader item of 'poor self-care'[3]).

Variables. Basic static (e.g., previous hospital admission), dynamic (e.g., change in care plan), and incident factors (e.g., premeditation) were recorded for each participant (see Tables 3 for the full list of variables). All dynamic risk factors were recorded as present or absent in the month prior to the firesetting or control incident. For example, the statement "Patient became verbally aggressive and hostile, demanding medication" was coded as the dynamic factor of *hostility* and "Phone call received from daughter stating that mother was going to commit suicide" was coded as the dynamic factor of suicidal ideation/self-harm. Only one statement such as those described above was required within each case file to provide evidence of each static, dynamic, or incident characteristic.

Coding. The first author collected and coded all files. To reduce possible bias, a second independent researcher—experienced in working with mentally disordered offenders—

[3] We set up the original checklist to obtain information on fire interest, passive personality, and confrontation avoidance. However, these variables had to be removed from the checklist because of difficulty ascertaining their presence/absence from file review data alone.

independently coded a randomly selected 20% of the patient files (*n* = 28; 14 MDFs, 14 MDCs). The two coders demonstrated a 100% concordance rate, whereby both had independently noted the same codes for all double coded files. The first author spent several hours training the coder using examples which may explain this exceptional concordance.

Data Analysis Strategy

Analyses were conducted using IBM SPSS statistics 24.0. Exploratory analyses were conducted using Pearson's χ^2 analyses (with Fisher's Exact test where expected cell sizes < 5). We did not correct for error regarding the number of univariate tests undertaken due to the novelty of the research questions and desire to ensure all potential risk factors were considered for model inclusion. Single step binary logistic regression was used to evaluate the combined predictive power of all significant univariate predictors, with all predictors assessed a priori for multicollinearity. Models were built iteratively such that variables were removed with reference to the Wald statistic, change in -2loglikelihood value, and the overall rate of correct classification. The aim of this process was to achieve the most parsimonious model with the best classification of cases. Outliers and influential cases were examined and reported for each final model. Logistic regression differentiation between target groups was assessed using the proportion of the sample correctly classified and the Receiver Operating Characteristic (ROC) curve. The area under the ROC curve (AUC) provides a metric for how well the overall model discriminates between the two target categories, with values > .71 indicating a large discriminatory effect (*d* = .80; Rice & Harris, 2005).

G*Power (Version 3.1; Faul, Erdfelder, Lang, & Buchner, 2007; with at least 80% power and $\alpha = .05$) indicated that 88 participants were required to conduct each χ^2 and detect a medium effect (.30), and 102 participants were required to conduct each independent *t* test and detect a medium effect (.50). Finally, Vittinghoff and McCulloch's (2007) simulation

study demonstrates that 10 participants for each IV (df) per outcome event is more than adequate for optimum model performance using binomial forced entry logistic regression.

Results

Predictors of Firesetting Versus other Incident Types

Univariate predictors of firesetting are shown in Table 1. For static factors, MDFs were differentiable from MDCs on their lower levels of substance use disorder and higher rates of previous psychiatric admission. There was also a trend towards MDFs being less likely to have a diagnosis of trauma/dissociative disorders relative to MDCs. MDFs and MDCs also differed on dynamic risk factors recorded one month prior to the incident. MDFs were more likely to express suicidal ideation/self-harm and be socially isolated in the month prior to the incident. However, relative to MDCs, MDFs were less likely to exhibit an external locus of control. There was also a trend towards MDFs having higher levels of impulsivity and lower levels of hostility relative to MDCs in the month prior to the incident. On general incident characteristics, MDFs were more likely to have targeted property and to have evidence of some premeditation of the incident relative to MDCs.

Entry of all significant univariate predictors and those trending towards significance into a logistic regression model showed that the model significantly improved upon chance prediction, χ^2 (6)= 39.71, p <.001 (see Model 1, Table 2 for model parameters). The final model correctly classified 74% of participants (80% of MDCs, 68% of MDFs). Only two outlier cases were identified through examination of standardised residuals, indicating no problems for model fit. A ROC curve calculated using the predicted probabilities for each case indicated that the model as a whole was very effective in discriminating between MDFs and MDCs (AUC = .80, p < .001).

Gender Sensitive Differentiation of Firesetting Versus Other Incident Types

Univariate analyses are shown in Table 1. Among the 80 women, MDFs were less likely than MDCs to have the static risk factor of a diagnosis of substance use disorder and more likely to have previous hospital admissions. On dynamic risk factors recorded one month prior to the incident female MDFs were more likely to be observed isolating themselves and to demonstrate impulsivity relative to female MDCs. There was a trend towards female MDFs being more likely than female MDCs to demonstrate emotional-regulation deficits and express suicidal ideation/self-harm in the month prior to their incident. On general incident characteristics, female MDFs were more likely than their MDC counterparts to target property and to premeditate the incident.

For multivariate analyses, suicidal ideation/self-harm was removed due to multicollinearity with multiple other variables (i.e., impulsivity, emotional-regulation, and premeditation) and we removed impulsivity due to a significant moderate correlation with emotional-regulation. The final logistic regression model (see Model 2, Table 2) significantly improved upon chance classification, χ^2 (5) = 40.74, p <.001, correctly classifying 80% of cases (86% of MDCs, 75% of MDFs) and obtaining an AUC of .88 (p < .001) in ROC analysis. Two cases were misclassified and obtained standardised residuals greater than 2, but this accounted for less than 5% of the sample suggesting model fit was adequate.

Among the 52 male participants, on static factors, MDFs were significantly more likely to have received a diagnosis for bipolar disorder and significantly less likely to have a diagnosis for substance use disorder. On dynamic risk factors recorded one month prior to the incident, male MDFs were significantly less likely than their male MDC counterparts to have exhibited hostility. For general incident characteristics, firesetting by male MDFs was more likely than control incidents to occur overnight and to target property. Due to small sample size and over-fitting, multivariate modelling was not possible for male participants.

Differentiating Between Male and Female Firesetters

Initial exploratory analyses showed that male and female MDFs were more similar than different across the variables and could only be differentiated on a small number of variables (see Table 3). On static factors, the 40 female MDFs were more likely than the 26 male MDFs to have received a diagnosis of a personality disorder. Further, on dynamic risk factors, female MDFs were more likely to have demonstrated problems with emotional-regulation and impulsivity in the month prior to the incident. On general incident characteristics, female MDFs were less likely to be intoxicated and more likely to target a person with their firesetting, which was typically themselves. There was also a trend for female MDFs to have experienced a triggering event in the month leading up to the incident relative to male MDFs.

Targeting self during the firesetting incident was highly correlated with setting a fire with the motivation of self-harm/suicide (p = .76) and with targeting property (p = -.94) so we removed this variable from subsequent analyses. Similarly, targeting property was strongly negatively correlated with setting fire with a motivation of self-harm/suicide (p = -.70) leading the two variables to be tested independently in the final multivariate model. Overall, the combination of variables examining intoxication at the time of the incident, impulsivity in the month prior to the incident, and targeting property during the incident was best able to differentiate male and female MDFs (see Model 3, Table 2 for model parameters). This model correctly classified 81% of cases, although it was more accurate in classifying female MDFs than male MDFs (95% vs. 58%). Outlier analyses showed three men were incorrectly classified as women. Although this represented less than 5% of the sample, it indicates some lack of fit. ROC analysis showed that the model effectively discriminated between male and female MDFs with an AUC of .85 (p < .001). Testing the same model but substituting ‘targeting property’ with the highly negatively correlated variable of ‘fire as self-

harm/suicide' motive for setting the index fire was marginally less effective overall in classifying cases (79% correct classification), but slightly more effective in correctly classifying male MDFs (88% female MDFs, 65% male MDFs).

Differentiating One-time and Repeat MDFs

Initial exploratory analyses showed a small number of differences between one-time (N = 34) and repeat (N = 32) MDFs. Repeat MDFs were more likely to have the static risk factor of a diagnosis of personality disorder and the dynamic risk factors of being more likely to be assessed as demonstrating impulsivity and isolating themselves in the month prior to the index incident. However, they were less likely to have been non-compliant with prescribed medications in the month prior to the incident. On incident characteristics, repeat MDFs were also less likely to take steps to extinguish their fire. In addition, there were trends towards repeat MDFs being more likely to set multiple fires during their fire incident; being more often assessed as having an external locus of control; less likely to have been requesting help from services prior to the incident, and less likely to have had a recent change in care plan. While proportionally more women were repeat firesetters (53% women vs. 42% men), there was no significant gender difference (χ^2 (1) = .66, p =.42).

Entering these variables into an iterative process of logistic regression resulted in a final model including four variables (see Model 4, Table 2). This model produced classification significantly different from chance χ^2 (4) = 22.28, p < .001 and correctly classified 71% of the sample (72% repeat MDFs, 71% one-time MDFs). There were no outlier cases identified using this model. ROC curve calculation showed a good probability of differentiating between groups using this model (AUC = .80, p < .001).

Discussion

This study is original and significant since it is the first to compare MDFs with a matched group of MDCs on potential static, dynamic, and incident-related risk factors. Overall, we found that mixed gender MDFs could be differentiated from MDC counterparts using a cluster of static, dynamic, and incident-related predictors (i.e., higher levels of previous hospital admissions, impulsivity, and incident premeditation, and lower levels of substance use disorder, hostility, and external locus of control). When risk predictor variables were examined separately for MDFs and MDCs subdivided by gender, we could only model risk predictors for females. Here, lower levels of substance misuse disorder diagnoses and higher levels of incident premeditation remained reliable predictors of female MDFs relative to female MDCs. However, emotional-regulation problems and social isolation in the month leading up to the incident uniquely predicted only *female* mentally disordered firesetting. Targeting property during the incident also predicted female MDFs versus female MDCs.

Previous research has highlighted that MDFs are characterised by a higher number of previous mental health service contacts or admissions relative to mentally disordered non-firesetting offenders (Ducat et al., 2013). Impulsivity has also been identified as being prevalent within MDFs (Räsänen, Puumalainen, Janhonen, & Väisänen, 1996). However, some of the mixed gender MDF predictors found in our study are somewhat new. For example, previous theoretical commentary—within the domain of firesetting more generally—has tended to portray firesetting as a form of learnt passive-aggressive hostility (see Gannon et al., 2012) and research (in the absence of adequate control groups) has reported substance dependence to be prevalent in a wide variety of firesetters (Grant & Kim, 2007; Ritchie & Huff, 1999). Our research—incorporating a matched control group—appears to challenge both assumptions since lower levels of substance misuse and hostility distinguished MDFs from their MDC counterparts. Nevertheless, it is possible that passive-

aggressive hostility was missed in our coding and that only overt hostility was coded. This may have resulted in exceptionally low levels of hostility being recorded for the firesetting group. Furthermore, no research has ever suggested that MDFs are more likely to premeditate an incident of firesetting relative to MDCs who commit other undesirable behaviours. This suggests a clear element of wilfulness to firesetting within psychiatric services.

Emotional-regulation problems have also been highlighted in MDFs and firesetters more generally (Geller, 1992; O'Sullivan & Kelleher, 1989; Tyler & Gannon, 2012). This static variable was a unique predictor of female firesetting—but was not associated with male firesetting—suggesting a clear gender difference. Given social isolation in the lead up to the firesetting was also a unique predictor for women, it is possible that they actively attempted to isolate themselves in order to plan their firesetting targeted at property. Alternatively, women may have premeditated their firesetting as a result of social isolation. In support of this latter hypothesis, research suggests that negative internal states, such as loneliness, can lead an individual to self soothe using fire, in an attempt to restore positive affect (Gannon et al., 2012; Ó Ciardha & Gannon, 2012).

Interestingly, when we examined the best predictors of female MDFs versus male MDFs, these groups were clearly distinguishable using only three variables: intoxication, impulsivity, and targeting property during the incident. Female MDFs exhibited lower levels of intoxication during their firesetting, were more impulsive in the month leading up to their firesetting, and were less likely to set fire to property. A closer examination of the female MDFs' firesetting targets illustrated that they focused on a person as a target; typically themselves. These findings appear to support Dickens et al. (2007) who found female MDFs were more likely to set fires to attract attention or as a form of 'parasuicide' relative to male MDFs (see also Miller & Fritzon , 2007) and that male MDFs were more likely than females to fireset whilst intoxicated. However, our findings also extend Dickens et al.'s through

suggesting that impulsive decision-making is particularly notable in female MDFs in the month leading up to their firesetting. Significant impulsivity issues are a key feature of borderline personality disorder and is more prevalent in female firesetters relative to males (see Ducat et al., 2017). Although borderline personality disorder was not highlighted separately in our study, it may explain why female MDFs targeted themselves when misusing fire. Our study extends previous findings through showing that many male MDFs appear to require a disinhibitor (i.e., intoxication) in order to misuse fire whereas females appear to hold internalised disinhibition (i.e., impulsivity).

Four key variables distinguished one-time and repeat MDFs. These variables spanned static and dynamic factors (i.e., personality disorder, medication non-compliance, external locus of control, and steps taken to extinguish the fire). In brief, repeat MDFs were likely to have a personality disorder diagnosis and to display an externalized locus of control in the lead up to their incident relative to one-time MDFs. Repeat MDFs were also less likely to have problems in medication compliance, or to take steps to extinguish the index fire. These results generally support the mainstream mentally disordered offending literature showing that recidivists demonstrate high levels of personality disorder (Coid, Hickey, Kahtan, Zhang, & Yang, 2007; Walter, Wiesbeck, Dittmann & Graf, 2011) and antisocial characteristics (Bonta, Blais, & Wilson, 2014).

Key Theoretical Contributions

Our findings provide important theoretical contributions to the MDF literature. First, they suggest that individuals who misuse fire—relative to other mentally disordered offenders—hold a more pervasive mental health history characterised by repeated hospitalisations, general impulsivity, and premeditation in relation to firesetting. This provides support for the dynamic risk factor of *coping and control* proposed within the M-

TTAF. Not only does this research show that this factor can discriminate firesetters from their non-firesetting counterparts, but it also highlights the complexity of *coping and control* as a risk factor. MDFs appear to be hold both strengths and weaknesses in this domain; demonstrating impulsivity in the lead up to their fire incident but also some level of willfulness that would require self-governance to implement. Further, our findings show that although male and female MDFs have similar risk characteristics there are also key differences. For example, when specifically compared to male MDFs (Model 3), female MDFs were characterised by marked problems with emotion-regulation and impulsivity which appeared to have resulted in them being more likely to misuse fire towards individuals such as themselves. This supports the emotionally expressive subtype of the M-TTAF which proposes that women, in particular, hold problems with impulsivity that result in fire misuse as a form of 'cry for help', self-harm, or suicide (see also Long, Dickens, & Dolley, 2014). Finally, our comparison of one-time and repeat firesetters (Model 4) highlighted that having a diagnosis of personality disorder, as well as an external locus of control, predicted repetitive fire use. This contributes to the M-TTAF through suggesting that these characteristics maintain firesetting in some way; perhaps via antisocial sentiments and cognitions (i.e., the *Attitudes* dynamic risk factor domain).

Strengths, Limits, and Future Directions

This study examined specialist archived NHS records obtained from clinical incident recording practices. This ensured that the data collected was ecologically grounded. We did, however, find that it was difficult to determine some key dynamic risk factors associated with mentally disordered firesetting because of this. For example, fire interest was not reliably measured or documented within patient files, and so we were unable to collect information on this dynamic risk variable. We also did not set out to examine whether MDFs who target self

or property differ in important ways. Future work might examine such differences to aid risk management within mental health care settings. Nevertheless, overall, our findings highlight the importance of examining male and female MDFs separately in future studies in order to develop gender-informed theoretical models of firesetting risk in mentally disordered firesetting. Our findings also highlight the importance of examining one-time versus repeat firesetters in order to further understand what drives persistent misuse of fire.

Conclusion

We found that numerous characteristics predict whether a mentally disordered individual has misused fire or engaged in some other undesirable behavior. Those who misused fire held more previous hospital admissions, exhibited impulsivity and incident premeditation as well as lower levels of substance use disorder, hostility, and external locus of control. When specifically examining females who had misused fire, relative to males, we found females were less likely to target property and held lower levels of intoxication during the incident. However, females exhibited more impulsivity. Finally we found those who had repeatedly misused fire were more likely to have a personality disorder and an external locus of control relative to one time offenders. Repeat offenders were also less likely to have medication compliance problems, or to try to extinguish their fire.

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Table 1

Univariate Predictors of Firesetting Incidents

Variable	Whole Sample (N = 132) % MDC, % MDF	χ^2, p	Females (N = 80) % MDC, % MDF	χ^2, p	Males (N = 52) % MDC, % MDF	χ^2, p
Static Factors						
Marital Status						
Single or Divorced	74.2, 84.8	2.28, .13	72.5, 82.5	1.15, .28	76.9, 88.5	.47[a]
Ethnicity (white)	92.4, 93.9	1.0[a]	95.0, 95.0	1.0[a]	88.5, 92.3	1.0[a]
Psychiatric Diagnoses						
Anxiety	4.5, 1.5	.62[a]	7.5, 2.5	.62[a]	0.0, 0.0	-
Personality Disorder	43.9, 50.0	49, .49	45.0, 60.0	1.81, .18	42.3, 34.6	.33, .57
Bipolar Disorder	13.6, 21.2	1.32, .25	20.0, 15.0	.35, .56	**3.8, 30.8**	**.02[a]**
Depressive Disorder	6.1, 10.6	.89, .35	10.0, 10.0	.00, 1.00	0.0, 11.5	.24[a]
Trauma/dissociative Disorder	**21.2, 9.1**	**3.77, .05**	17.5, 7.5	1.83, .18	26.9, 11.5	1.98, .16
Substance Use Disorder	**54.5, 19.7**	**17.17, < .001**	**45.0, 17.5**	**7.04, .01**	**69.2, 23.1**	**11.1, < .001**
Psychotic Disorder	50.0, 54.5	.27, .60	42.5, 52.5	.80, .37	61.5, 57.7	.08, .78
Neurological Disorder	25.8, 16.7	1.63, .20	30.0, 22.5	.58, .45	19.2, 7.7	.42[a]
Previous Hospital Admission	**69.7 84.8**	**4.31, .04**	**70.0, 90.0**	**5.0, .03**	69.2, 76.9	.39, .53
Dynamic Factors[b]						
Active MI Symptoms	77.3, 81.8	.42, .52	82.5, 82.5	.00, 1.00	69.2, 80.8	.92, .34
Change in Care Plan	36.4, 33.3	.13, .72	37.5, 32.5	.22, .64	34.6, 34.6	.00, 1.00
Dependency on Others	9.1, 10.6	.09, .77	15.0, 10.0	.46, .50	0.0, 11.5	24[a]
Emotional-regulation Problems	62.1, 71.2	1.23, .27	**62.5, 82.5**	**4.01, .05**	61.5, 53.8	.32, .58
External Locus of Control	**24.2, 10.6**	**4.27, .04**	22.5, 12.5	1.39, .24	26.9, 7.7	.14[a]
Impulsivity	**59.1, 74.2**	**3.41, .07**	**65.0, 87.5**	**5.59, .02**	50.0, 53.8	.08, .78
Hostility	**84.8, 71.2**	**3.58, .06**	75.0, 72.5	.07, .80	**100, 69.2**	**< .001[a]**
Medication Non-compliance	40.9, 43.9	.12, .73	42.5, 40.0	.05, .82	38.5, 50.0	.70, .40
Mood Fluctuation	9.1, 7.6	.10, .75	12.5, 10.0	1.00[a]	3.8, 3.8	1.00[a]
Poor Physical Health	18.2, 19.7	.05, .82	25.0, 17.0	67, .41	7.7, 23.1	.25[a]
Poor Self Care	54.5, 60.6	.49, .48	52.5, 55.0	.05, .82	57.7, 69.2	.75, .39
Relationship Problems	37.9, 47.0	1.12, .29	35.0, 52.5	2.49, .12	42.3, 38.5	.08, .78
Requests Help from Services	13.6, 18.2	.51, .48	12.5, 12.5	.00, 1.00	15.4, 26.9	1.04, .31

Social Isolation	**19.7, 36.4**	**4.54, .03**	**10.0, 40.0**	**9.6, < .001**	34.6, 30.8	.09, .77
Substance Misuse	31.8, 39.4	.83, .36	25.0, 32.5	55, .46	42.3,50.0	.31, .58
Suicidal Ideation/Self-Harm	**45.5, 63.6**	**4.40, .04**	**50.0, 70.0**	**.33, .07**	38.5, 53.8	1.24, .27
Treatment Disengagement	47.0, 40.9	.49, .48	47.5, 37.5	.82, .37	46.2, 46.2	.00, 1.00
Triggering Event	53.0, 43.9	1.09, .30	62.5, 52.5	.82, .37	38.5, 30.8	34, .56
Incident Characteristics – General						
Incident Occurred at Night [(10pm-6am)]	28.8, 42.4	2.68, .10	35.0, 40.0	.21, .64	**19.2, 46.2**	**4.28, .04**
Intoxication	19.7, 22.7	.18, .67	17.5, 10.0	.95, .33	23.1, 42.3	2.19, .14
Targeted Property	**8.3, 53.0**	**28.98, < .001**	**5.7, 37.5**	**10.76, < .001**	**12.0, 76.9**	**21.7, < .001**
Threats Prior to Incident	27.3, 25.8	.04, .84	25.0, 30.0	.25, .62	30.8, 19.2	.92, .34
Premeditation	**34.8, 60.6**	**8.78, < .001**	**30.0, 62.5**	**8.50, < .001**	42.3, 57.7	1.23, .27

Note. boldface indicates variables significant at $p < .05$ or trending towards significance at this level. [a] indicates Fisher's Exact Test; [b] indicates measurement one month prior to the incident.

Table 2

Best Final Differentiating Logistic Regression Models

	β	Wald	*p*	OR	95% CI for OR	
					Lower	Upper
Model 1 (*N* = 132)						
MDFs vs. MDCs						
Premeditation	1.17	8.05	.01	3.22	1.44	7.21
Substance Use Disorder	-1.70	15.00	< .001	.18	.08	.43
Impulsivity	.99	4.86	.03	2.69	1.12	6.49
Hostility	-.86	3.03	.08	.42	.16	1.12
External Locus of Control	-.90	2.58	.11	.41	.14	1.22
Previous Hospital Admissions	.86	3.01	.08	2.37	.89	6.29
HL goodness of fit: χ^2 (7) = 3.90, *p* =.79						
Model 2 (*N* = 80)						
Female MDFs vs. Female MDCs						
Premeditation	2.01	7.40	.01	7.63	1.76	32.97
Substance Use Disorder	-2.10	6.73	.01	.12	.03	.60
Emotion-regulation	1.73	4.24	.04	5.67	1.09	29.52
Social Isolation	1.61	4.32	.04	4.99	1.10	22.72
Property Target	2.63	5.86	.02	13.81	1.65	115.70
HL goodness of fit: χ^2 (6) = 1.42, *p* =.97						
Model 3 (*N* = 66)						
Male MDFs vs. Female MDFs*						
Intoxication	-1.86	5.55	.02	.16	.03	.73
Impulsivity	2.42	8.81	.01	11.25	2.28	55.58
Property Target	-2.03	7.80	.01	.13	.03	.54
HL goodness of fit: χ^2 (4) = 2.30, *p* =.68						
Model 4 (*N* = 66)						
One-time MDFs vs. Repeat MDFs°						
Personality Disorder	1.28	4.54	.03	3.58	1.11	11.56
Steps Taken to Extinguish Fire	-2.06	5.17	.02	.13	.02	.75
Medication Non-compliance	-1.44	5.71	.02	.24	.07	.78
External Locus of Control	2.76	3.36	.07	15.73	.83	300.0
HL goodness of fit: χ^2 (5) = 2.75, *p* =.74						

Note. * Female gender is coded as presence of outcome in Model 3; ° Repeat firesetting is coded as presence of outcome in Model 4.

Table 3.

Univariate Predictors differentiating between sub-sets of mentally disordered firesetters

Variable	% Females (*N* = 40)	% Males (*N* = 26)	χ^2, *p*	% One-Time (*N* = 34)	% Repeat (*N* = 32)	χ^2, *p*
Static Factors						
Gender (female)	-	-	-	55.9	65.6	.66, .42
Marital Status						
Single or Divorced	82.5	88.5	.73[a]	88.2	81.3	.51[a]
Ethnicity (white)	95.0	92.3	.64[a]	91.2	96.9	.61[a]
Diagnoses						
Personality Disorder	**60.0**	**34.6**	**4.06, .04**	**35.3**	**65.6**	**6.01, .01**
Bipolar Disorder	15.0	30.8	2.35, .13	20.6	21.9	.02, .90
Depressive Disorder	10.0	11.5	1.0[a]	11.8	9.4	1.0[a]
Trauma/dissociative Disorder	7.5	11.5	.67[a]	11.8	6.3	.67[a]
Substance Disorder	17.5	23.1	.31, .58	11.8	28.1	2.79, .10
Psychotic Disorder	52.5	57.7	.17, .68	55.9	53.1	.05, .82
Neurological Disorder	22.5	7.7	.18[a]	17.6	15.6	.05, .83
Previous Hospital Admission	90	76.9	.18[a]	82.4	87.5	.73[a]
Dynamic Factors[b]						
Active MI Symptoms	82.5	80.8	1.0[a]	79.4	84.4	.27, .60
Change in Care Plan	32.5	34.6	.03, .86	**23.5**	**43.8**	**3.03, .08**
Dependency on Others	10.0	11.5	1.0[a]	17.6	3.1	.11[a]
Emotional-regulation Problems	**82.5**	**53.8**	**6.31, .01**	64.7	78.1	1.45, .23
External Locus of Control	12.5	7.7	.70[a]	**2.9**	**18.8**	**.05[a]**
Impulsivity	**87.5**	**53.8**	**9.33, < .01**	**61.8**	**87.5**	**5.71, .02**
Hostility	72.5	69.2	.08, .77	64.7	78.1	1.45, .23
Medication Non-compliance	40.0	50.0	.64, .42	**58.8**	**28.1**	**6.31, .01**
Poor Physical Health	17.5	23.1	.31, .58	23.5	15.3	.65, .42
Poor Self Care	55.0	69.2	1.34, .25	61.8	59.4	.04, .84
Relationship Problems	52.5	38.5	1.25, .26	44.1	50.0	.23, .63
Requests Help from Services	12.5	26.9	.19[a]	**26.5**	**9.4**	**3.23, .07**
Social Isolation	40.0	30.8	.58, .45	**23.5**	**50.0**	**4.99, .03**
Substance Misuse	32.5	50.0	2.02, .16	41.2	37.5	.09, .76

Suicidal Ideation/Self-Harm	70.0	53.8	1.78, .18	58.8	68.8	.70, .40
Triggering Event	**52.5**	**30.8**	**3.02, .08**	44.1	43.8	.00, .98
Incident Characteristics – General						
Incident Occurred at Night (10pm-6am)	40.0	46.2	.24, .62	38.2	46.9	.50, .48
Intoxication	**26.7**	**73.3**	**9.37, < .01**	26.5	18.8	.56, .45
Threats Prior to Incident	30.0	19.2	.96, .33	17.6	34.4	2.41, .12
Premeditation	62.5	57.7	.15, .70	55.9	65.6	.66, .42
Incident Characteristics – Firesetting						
Fire Target						
Property	**37.5**	**76.9**	**9.83, < .01**	50.0	56.3	.26, .61
Person	**62.5**	**23.1**	**As above[c]**	50.0	43.8	As above[c]
Fire Target was Self	**57.5**	**23.1**	**7.58, .01**	44.1	43.8	.00, .98
Fire Location						
Hospital Bedroom	30.8	42.3	4.35, .23	24.8	46.9	5.50, .14
Community	25.6	38.5	As above[c]	42.5	18.8	As above[c]
Hospital Corridor	23.1	7.7	As above[c]	18.2	15.6	As above[c]
Garden	20.5	11.5	As above[c]	15.2	18.8	As above[c]
Steps Taken to Extinguish Fire	12.5	23.1	1.27, .32	**26.5**	**6.3**	**4.85, .03**
Fire as Self-harm/Suicide	57.5	30.8	4.52, .03	44.1	50.0	.23, .63
Multiple Ignition Points	5.0	15.4	.20[a]	8.8	9.4	1.00[a]
Spate Firesetting	15	11.5	1.0[a]	**5.9**	**21.9**	**.08[a]**

Note. Boldface indicates variables significant at $p < .05$ or trending towards significance at this level. [a] indicates Fisher's Exact Test; [b] indicates measurement one month prior to the incident; [c] = single multi-category analysis of frequencies differences used.