Do Deliberate Firesetters hold Fire-Related Scripts and Expertise? A Quantitative Investigation using Fire Service Personnel as Comparisons

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Abstract

Purpose. This research investigated, for the first time, the presence of fire-related scripts and expertise in males who have set deliberate fires.

Method. One hundred and twenty-seven participants (34 firesetters, 34 offender comparisons, 34 fire service personnel, and 25 community comparisons) were asked to solve problem scenarios (e.g., destroying evidence) using fire. These scenarios were designed to tap into fire-related scripts and expertise. Other known fire-related variables (e.g., serious fire interest) were also examined using the Four Fire Factor Scales (Ó Ciardha, Tyler, & Gannon, 2016).

Results. Firesetters held more scripts and were more expert in firesetting relative to Offender and Community Comparisons. However, firesetters' responses could not be differentiated from Fire Service Personnel. A multiple regression showed that identification with fire was an important predictor of firesetting scripts, and both identification with fire and serious fire interest uniquely predicted firesetting expertise.

Conclusions. This study has empirically demonstrated for the first time that firesetters hold fire supportive scripts and expertise in fire misuse. Furthermore, the inclusion of Fire Service Personnel demonstrated that both those who misuse fire and those who interact with it pro-socially exhibit cognitive and behavioural characteristics associated with the presence of fire-related scripts and expertise.

Keywords: firesetting, arson, expertise, scripts, schema

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Background

Deliberate firesetting is an international public health issue of vast proportions. Between 2007 and 2011 alone, 282,600 deliberate fires were set in the US, causing 420 deaths, 1,360 casualties, and $1.3 billion in property damage (Campbell, 2014). Throughout this paper, the term firesetting will be used to describe all intentional acts of setting a fire. This allows consideration of all deliberate firesetting rather than just those that culminate in criminal convictions for 'arson'. As the participants in the forthcoming study were males over the age of 18 years old, we use the term firesetter to refer to adult male firesetters.

Firesetting theory and research is accumulating. Recent advances include: the development of a comprehensive multifactorial theory of adult firesetting (Gannon, Ó Ciardha, Doley & Alleyne, 2012) and the development of specialist group therapy that reduces characteristics associated with firesetting risk (Gannon et al., 2015; Tyler, Gannon, Lockerbie, & Ó Ciardha, 2017). However, there are still many key explanatory factors yet to be examined, two of which are scripts and expertise. In this manuscript, we focus on for the first time, the existence of fire-related scripts and expertise in males who have set deliberate fires. The preceding discussion will outline the literature, in both wider and forensic psychology, regarding scripts and expertise, followed by an overview of fire related scripts and expertise, as hypothesised by Butler and Gannon (2015).

Scripts

Gannon et al. (2012) paid brief attention to the notion of scripts when outlining the Multi-Trajectory Theory of Adult Firesetting (M-TAFF). Gannon and colleagues suggested that firesetting scripts (i.e., a set of cognitive rules about when and why fire should be used) may be important for explaining firesetting aetiology. However, very little information was

provided regarding the form such scripts would take, or how these scripts might interact with other fundamental features of firesetting behaviour. More recently, Butler and Gannon (2015) hypothesised a preliminary conceptual framework of firesetting scripts. Based upon previous research findings, and their own clinical experience of working with firesetters, Butler and Gannon (2015) described the content, structure, and aetiological functions of firesetting scripts. To date, this framework offers the most comprehensive attempt to address this key gap in the literature, however, it is yet to be empirically tested.

The notion of scripts is well established in the wider psychology literature (Schank & Abelson, 1977; Tomkins, 1991; Ward & Hudson, 2000; Ward & Siegert, 2002). Generally speaking, scripts are considered to be cognitions. These cognitions direct behaviour in a given situation (Huesmann, 1988); providing cognitive shortcuts (Schmidt, Norman, & Boshhuizen, 1990) and impact how an individual attends to, organises, and recalls information (Baldwin, 1992; Beauregard, Proulx, Rossmo, Leclerc, & Allaire, 2009; Bellezza & Bower, 1981; Bower, Black, & Turner, 1979, Demorest, 1995; Gibbs & Tenney, 1980; Graesser, Woll, Kowalski, & Smith, 1980; Zadney & Gerard, 1974).

Cognitive scripts are aetiologically useful, as they aid in the understanding of complex human behaviour, through providing explanations about why individuals engage in specific behaviour. Scripts have been used to describe a wide variety of forensic behaviours such as aggression (Huesmann, 1988; Huesmann & Eron, 1984), crime (Cornish, 1994; Ward & Hudson, 2000), and sexual behaviour (Gagon, 1990; Ward & Hudson, 2000; Ward & Siegert, 2002). For example, with regards to aggression, aggressive behaviour is hypothesised to result from the formation of aggression scripts in childhood. These scripts are encoded and rehearsed, and become preferentially retrieved in order to solve problems. Such scripts are learnt through a dual process of observational and enactive learning (Huesmann, 1988;

Huesmann & Eron, 1984). All scripts are conceptualised as being largely goal dependent (Butler & Gannon, 2015; Gagon, 1990; Ward & Hudson, 2000; Ward & Siegert, 2002).

Expertise

Similarly to scripts, another key facet of firesetting behaviour in need of consideration is that of expertise. Expertise is considered "the characteristics, skills and knowledge that distinguish experts from novices and less experienced people" (Ericsson, 2006, p. 30). Butler and Gannon (2015) were the first to suggest that expertise may play a crucial role in firesetting. Butler and Gannon (2015) provided robust hypotheses as to the form firesetting expertise may take, highlighting key 'skills' an expert firesetter may develop. However, akin to that of firesetting scripts, firesetting expertise is a concept yet to be empirically tested.

Much like scripts, expertise has also been considered both in the wider psychology literature and in relation to specific offending behaviour. Within these literatures, an expert is conceptualised to have acquired such status through deliberate practice. A common domain of expertise is that of chess. Chess masters are said to chunk patterns and game positions in their long term memory allowing them to exhibit superior game play. The concept of expertise has now been applied to offending behaviour in the form of burglary (Nee, 2015), carjacking (Topalli, Jacques, & Wright, 2015), drug-related offending (Casey, 2015), identity theft (Vieraitis, Copes, Powell, & Pike, 2015), intimate partner violence (Day & Bowen, 2015), homicide (Brookman, 2015), sexual offending (Bourke, Ward & Rose, 2012; Ó Ciardha, 2015; Ward, 1999), and violent offending (Topalli, 2005) although relatively few applications involve empirical testing (with the notable exception of burglary; see below). Nee and Ward (2015) have defined offence-related expertise as:

> the acquisition of cognitive processes and consequent behaviour that are demonstrably superior to those new to a given domain, in the sense that they

> are faster, more cognitively economical, are triggered automatically in relevant environments and are based on considerable experience and honing of skills over time. (p. 2)

Burglary is a particularly well established area of offending expertise. From the research conducted within this domain, we know that burglars: (1) explicitly discriminate between targets using environmental cues (e.g., occupancy, accessibility, and security; Bennett & Wright, 1984; Maguire & Bennett, 1982); (2) use distinctive and systematic routes during the commission of a burglary (Nee et al., 2014; Taylor & Nee, 1988); and (3) rely on previous learning when making decisions regarding target selection and responses to environmental cues (Nee & Taylor, 2000).

Firesetting Scripts

As previously stated, the notion of cognitive and behavioural factors increasing the efficacy of firesetting has yet to be empirically investigated. Recently, however, Butler and Gannon (2015) proposed a framework of what these cognitions and behavioural factors might look like. Four firesetting scripts have been proposed. First, *fire is a powerful messenger of revenge/warning* refers to a script where fire is viewed as being the most appropriate and powerful means by which to teach others a lesson or warn others away. Second, *fire is the best way to destroy evidence* refers to a specific script concerning how fire should be employed to destroy evidence of another criminal act (e.g., car theft, murder). Third, fire as a *cry for help* relates to the use of fire to satisfy an unmet need, such as a need for attention or to reduce feelings of depression. Finally, *fire is soothing* relates to the utilisation of fire to self-soothe and restore positive affect. These four goal orientated scripts explain *why* an individual would misuse fire in a given situation since fire scripts guide an individual to know when it is appropriate to use fire.

Butler and Gannon (2015) suggest that, similar to aggression scripts, firesetting scripts develop during childhood. Here, information may be encoded about the destructive nature of fire, and its usefulness in certain situations, leading to the development of an unhealthy relationship with fire. These scripts are then relied upon, and—in combination with other factors (e.g., offence supportive cognition)— direct fire-related behaviour in adulthood. Differences in childhood learning experiences are also hypothesised to account for the heterogeneity of scripts held by firesetters.

Firesetting Expertise

With regards to expertise, Butler and Gannon (2015) have hypothesised two clear areas of firesetting expertise, these being: fire knowledge and avoiding detection. Fire knowledge refers to expertise surrounding how to set the most proficient fire in a given situation. For example, setting a fire to destroy evidence may require the use of an accelerant and multiple ignition points to increase the speed and intensity of the fire. Setting a fire to self soothe, on the other hand, may require knowledge of how to set a much smaller, more 'contained' fire. Avoiding detection refers to utilising techniques that increase the probability of avoiding detection during the commission of a fire. Such techniques could include: choosing a secluded or quiet area to set a fire, involving acquaintances/ criminal associates to acquire specific items needed to set the fire (e.g., petrol), an awareness of Closed Circuit Television (CCTV), or the existence of a firesetting toolkit which may include the tools needed to set a fire (e.g., a lighter and accelerant). Butler and Gannon (2015) have hypothesised that such expertise, in line with Ward and Nee's (2015) definition of expertise, is gained and refined through engaging in deliberate firesetting repeatedly (i.e., deliberate practice). This allows firesetters to develop expertise about fire that others, who do not engage in deliberate practice, do not have. Firesetting expertise is hypothesised to represent

the *how* of firesetting behaviour (i.e., how one can set the most proficient fire to achieve a desired goal; Butler & Gannon, 2015).

In addition to empirically investigating scripts and expertise, this research seeks to explore how these novel concepts are related to more established correlates of firesetting behaviour; namely the fire-related variables of serious fire interest, normalisation of fire, identification with fire, and fire safety awareness). Previous research has shown that, relative to non-firesetting comparisons (including individuals who have offended), firesetters report higher levels of serious fire interest, normalisation of fire, identification with fire, and lower levels of fire safety awareness (Clare, Murphy, Cox, & Chaplin, 1992; Dickens et al., 2009; Gannon et al, 2013; Gannon et al., 2015; Haines, Lambie, & Seymour, 2006; Ó Ciardha et al., 2014; Taylor, Thorne, Robertson & Avery, 2002). In fact, an interest in serious fires (such as building fires) has been identified as one of the most successful predictors for distinguishing firesetters and non-firesetters (Gannon et al., 2013; Tyler, Gannon, Dickens, & Lockerbie, 2015). However, no one has compared the fire interest or other fire-related variables of firesetters with pro-social groups of individuals who are likely to be interested in fire and yet not misuse it (e.g., Fire Service Personnel). This research will empirically investigate, for the first time, if firesetters, compared with other participants, hold specific scripts relating to fire and demonstrate expertise in relation to their firesetting offending.

This research is also unique since, for the first time, it will recruit fire service professionals (FSP) as a comparison group. FSP provide an interesting comparison group as they interact with fire pro-socially and have extensive experience with fire. The authors of this paper suggest that it is plausible to propose that FSP will have had unique experiences with fire and hold similar cognitive information as firesetters. FSP are observing firesetting behaviour daily, with some FSP provide safety interventions for firesetters, and acquiring information about why firesetters have used fire in a given situation. These experiences with

fire will arguably lead to the development of knowledge about fire and its misuse. With regards to expertise, again conceivably, FSP will have developed similar expertise in relation to fire knowledge and accumulated considerable amounts of training and direct experience of dealing with the complexities involved with different types of fires (e.g., the use of accelerant, multiple ignition points, and the use of highly flammable material) and those involved in fire investigation will have a wealth of first-hand experience in investigating fires and the methods used to avoid detection. Thus, it is credible to suggest that FSP too will have stored retrievable information in their long-term memory.

Hypotheses

Numerous hypotheses will be explored. To begin, we examine scripts and expertise. In terms of scripts, it is hypothesised that compared to offender comparisons and community comparisons, firesetters will hold more firesetting scripts. In line with the continuum of expertise proposed by Nee and Ward (2015), it is hypothesised that firesetters will possess more expertise than both offender and community comparisons. However, given FSPs' extensive knowledge about fire, and its acquisition, it is hypothesised that FSP may also occupy the expert end of the continuum. Following this, we examine established correlates of firesetting in the form of fire-related variables. We hypothesise that firesetters will report the highest levels of identification with fire, serious fire interest, and normalisation of fire relative to offender and community comparisons. However, given FSPs' role to educate the public around fire safety awareness, we anticipate that they will possess the highest levels of fire safety awareness, relative to offender and community comparisons and firesetters, with firesetters possessing the lowest levels of fire safety awareness of any participant group. Finally, this study will explore which factors from the Four Fire Factor Scale predict the presence of firesetting scripts and expertise. Based on script and expertise theory, we anticipate that interest in fire, identification with fire, and normalisation of fire will

significantly predict both scripts and expertise since these cognitions—which symbolise some extensive attraction towards and affinity with fire—are likely to form the basic building blocks of firesetting script and expertise development.

Method

Participants

The sample consisted of 127 male participants (34 firesetters, 34 offender comparisons, 34 FSP, and 25 community comparisons). Firesetters were recruited from one English prison establishment in the South East of England, and selected from institutional file records indicating either a current or previous conviction for a firesetting offence (i.e., arson; $n = 24$), fire used in the commission of a wider offence ($n = 4$), or prison firesetting activity (e.g., prison documented cell fires; $n = 6$). Fifteen participants were repeat firesetters and had received a previous conviction for a firesetting offence, ranging from 1 to 9 previous offences. Their security information was reviewed and any participant who had a security alert relating to risk of hostage taking or risk to female staff were excluded. A further 29 firesetters were approached, but declined to take part (i.e., there was a firesetter participation rate of 54%).

Offender comparisons were recruited from the same English prison establishment, and were individuals who had received a conviction for a non-firesetting offence, held no previous firesetting conviction, or recorded history of firesetting. These participants were recruited randomly by searching for all prisoners located on each wing of the prison and then selecting every fifth name on the list generated. Again, security information was reviewed and any participant who had a security alert relating to risk of hostage taking or risk to female staff were excluded. Participants had either an index offence relating to violence ($n = 21$), theft ($n = 7$), drugs ($n = 4$) or property ($n = 2$). A further 19 offender comparisons were

approached, but declined to take part (i.e., there was an offender comparison participation rate of 64%).

FSP were recruited from three English Fire and Rescue Services in the South East of England. Information about the study was cascaded through the first author attending regional meetings, and the inclusion of the study in a multi-regional fire service newsletter. Individual participants were then identified with the assistance of a member of the fire service. All fire service professionals were current employees of the Fire and Rescue Service (*M* length of service = 21 years, *SD* = 7.35). All FSP who were approached agreed to take part (i.e., there was a FSP participation rate of 100%).

Community comparisons were recruited from two counties in the South East of England. Participants responded to advertisements placed in local community centres, supermarkets, University campus, and research participation websites. In order to maximise the similarity in demographic characteristics across participant groups (e.g., age) university students were not permitted to take part in the study. As community comparisons self-selected there was a participation rate of 100%.

Overall, 83% (*n* = 106) of the entire sample identified themselves as being White-UK/Irish. In order to be eligible for participation, all participants were required to comprehend and speak English sufficiently to read and understand questionnaires. A more detailed breakdown of participants' demographic information can be seen in Table 1.

Participants differed significantly in age, $F(3, 123) = 3.41$, $p = .02$, $\eta_p^2 = .08$. Games – Howell post-hoc testing revealed that firesetters were significantly younger than FSP ($p < .01$, $d = 0.90$) as were offender comparisons ($p < .05$, $d = 0.63$). Groups also significantly differed on years spent in formal education, $F(3, 123) = 15.87$, $p < .001$, $\eta_p^2 = .28$ with firesetters and offender comparisons self-reporting significantly lower numbers of years in education relative to FSP ($p < .001$, $d = 1.07$ and $p < .001$, $d = 0.78$ respectively) and

community comparisons ($p < .001$, $d = 1.46$ and $p < .001$, $d = 1.24$ respectively). Furthermore, community comparisons self-reported a significantly higher number of years in education relative to FSP ($p < .05$, $d = 0.82$). Participants also differed significantly on ethnicity, χ^2 (3, N =127) = 21.52, p <.001, φc =.41[1]. Post-hoc testing using adjusted z scores and Bonferroni adjusted alpha levels highlighted that offender comparisons were less likely to report being White British than expected by chance (p <.05). This may be due to Black and Minority Ethnic (BAME) participants being overrepresented in this study (42%) compared with the UK prison population as whole (27%; House of Commons Library, 2019). Participant groups also differed significantly on their engagement with mental health services, χ^2 (3, N = 127) = 44.32, $p < .001$, φc =.59. Adjusted z scores and a Bonferroni correction highlighted that offender comparisons and FSPs reported lower levels of engagement with mental health services than expected by chance ($p < .05$), as did community comparisons ($p < .01$). However, firesetters reported higher levels of engagement with mental health services than expected by chance ($p < .001$). Ducat, Ogloff and McEwan (2015) have shown mental health problems are a known characteristic of firesetters, and so this finding is to be expected. Finally, firesetters and offender comparisons did not differ on their levels of engagement with offending behaviour programmes, χ^2 (1, N =68) = .36, p = .55, φ =. -07.

Measures

All measures were presented in a randomised order to participants. We report internal reliability according to the following criteria (George & Mallery, 2003): ≥ .90 excellent, .89 to ≥ .80 good, .79 to ≥ .70 acceptable, and .69 to .60 questionable.

[1] Although the expected count for the number of BAME community comparisons was less than 5 (12.5% of all expected counts), the rule of thumb of "No more than 20% of the expected counts are less than 5 and all individual counts are 1 or greater" (Yates, Moore & McCabe, 1999, p. 734) was applied.

Impression Management. The *Impression Management Scale* (IM) of the Paulhus Deception Scales (Paulhus, 1991) measures a participant's level of faking good (i.e., attempts to present oneself in a positive light). The scale consists of 20 self-report items (e.g., "I never drive faster than the speed limit") rated on a 5-point scale (1 = not true, 5 = very true). The IM has been used extensively with offending populations (Paulhus, 1991), and has established psychometric properties. In our current study, measure reliability was acceptable ($\alpha = .72$). Each test was hand scored by the first author, and then checked using a computer algorithm for accuracy.

Fire-Related Measures. As directed by Ó Ciardha, Tyler, and Gannon (2016) three pre-existing questionnaires were administered to obtain each of the subscale and total scores that constitute the Four Factor Fire Scales; the Fire Interest Rating Scale (Murphy & Clare, 1996), the Fire Attitude Scale (Muckley, 1997), and the Identification with Fire Scale (Gannon, Ó Ciardha & Barnoux, 2011). Ó Ciardha et al.'s. (2014) factor analysis demonstrated that The Four Factor Fire Scales (identification with fire, serious fire interest, normalisation of fire, and poor fire safety) discriminated firesetting individuals from non-firesetting individuals (see also Gannon et al., 2013) and had good internal consistency (αs = .88, .86, .73, .68 respectively; Gannon et al., 2013). The summed total score of these items is also reported to hold excellent internal consistency ($\alpha = .90$; see Ó Ciardha et al., 2016). This measure was hand scored using the hand scoring template designed by Ó Ciardha et al. (2016). The present study showed varying reliability scores for the subscales (see Table 2).

Script Measure. This measure was adapted from Cazalis, Azouvi, Sirigu, Agar, and Burnod (2001), who utilised a script generation method to assess the script knowledge of participants following Traumatic Brain Injury. Cazalis et al. (2001) asked participants to generate scripts relating to three activities, differing in degree of familiarity: *Routine* ("preparing to go to work in the morning"), *Non-routine* ("taking a trip to Mexico"), and

Novel (“opening a beauty salon”). Participants were asked to generate a script for each activity by stating the different individual actions/steps necessary to achieve the proposed goal. Additionally, each participant was asked to evaluate how important each step was for goal completion, on a 5-point rating scale. In the current study, this script generation method was used to assess the presence of each of the four hypothesised scripts (i.e., fire is a powerful messenger, fire destroys evidence, fire as cry for help, and fire is soothing). Scripts were presented, one-by-one, on paper, in the form of imaginary scenarios (e.g., “Imagine you wanted to send somebody a message using fire”). Similar to Cazalis et al.’s study (2001), participants were asked to state the different individual actions/steps necessary to achieve the proposed goal, in this case setting a fire. Importantly, however, instead of asking participants to rate how important they thought each step was, in the current study participants were required to explain *why* they had included each step. Asking participants to explain *why* they had included each step was used to establish whether the participant held that script.

Participants were given an example scenario that had been completed to demonstrate what they were required to do:

> “Here is an example of somebody ordering a drink at a bar,
> and the steps they would need to take in order to do this:
> Step 1 -You walk into a Wetherspoons and walk up to the
> bar
> WHY – because you know you have to order your drink
> at the bar
> Step 2 – You wait in the queue to be served
> WHY – because you know you have to wait your turn

> Step 3 – You tell the person behind the bar what you want
> WHY – because you know that you have tell to them so that
> they can make your drink
> Step 4 – You pay for your drink
> WHY – because you know you have to pay in order to
> get your drink"

After being shown the example imaginary scenario participants were then presented with the four fire imaginary scenarios, representing the four scripts, for them to complete. An example response given by a participant to the imaginary scenario "Imagine you wanted to send somebody a message using fire" was:

> "*Step 1* – I would choose to set fire to their house.
> *Why* – Because setting fire to somebody's home means
> they'll get the message that you are serious. You mean
> business when you set someone's house on fire, you know
> what I mean?
>
> *Step 2* – I would get petrol from the garage and pour it through
> their letterbox.
> *Why* – Using petrol means you ain't messing about. They'll
> get the message alright.
>
> *Step 3* – I would light a rag and throw it through the
> letterbox.

> *Why* – To light the petrol. Using a rag would be safer than using a lighter.
>
> *Step 4* – I would run away as fast as I could.
> *Why* – Because I ain't getting caught for it."

This measure was scored, using scoring instructions, by two postgraduate independent raters, who were blind to participant groups. The scoring guidelines provided to raters for the scenario above were:

> "Did the participant clearly articulate that they would use fire to send a message of revenge or a warning? Did the participant clearly articulate that they thought fire was a powerful way to send a message? Did the participant endorse that using fire means the victim will get the message?"

Scoring instructions were derived from clinical experience and literature pertaining to expertise in other domains. Raters were asked to give each scenario a score of either '0' (script absent) or '1' (script present). A '0' was awarded if the participant provided no answer (i.e., they were unable to see how fire could be used in that situation), little information was given as to *why* they had included a step, or their answer was strikingly different from the guidelines for that scenario. A '1' was awarded when the participant clearly articulated why they had included each step, and it closely matched the guidelines for that scenario.

Instances of disagreement were rectified through the first author facilitating rater discussion. Each rater was asked to explain their rationale for a specific score, and then encouraged to consider the merits of the others' rationale. Raters had to come to a unanimous decision of the absence or presence of a script, although this was not possible for three cases

(0.6%, n = 3 of all cases rated) and so the first author decided whether the script was present or absent. Then a total score, ranging from 0 to 4, was calculated for each participant by adding together the agreed score for all four imaginary scenarios. A higher score represented a higher number of scripts held by that participant. The average script score for each participant group can be seen in Table 2. According to Landis and Koch (1977), the pre discussion interrater agreement for the presence of scripts was substantial (Kappa = 0.78, p < .001), with the post discussion level being almost perfect (Kappa = 0.93, p < .001; see Table 2).

Expertise Measure. Adapted from successful measures used with burglars (Nee & Taylor, 1988; Taylor & Nee, 1988), this measure sought to tap into the firesetting expertise of participants. As scripts and expertise are hypothesised to be complimentary concepts, the scenarios mirrored the four firesetting scripts outlined earlier. Participants were presented with eight scenarios (two scenarios representing each of the four scripts), such as:

> "Imagine you have stolen a car with your friend, you've driven around in it for a while and now you have decided you need to dump it and get rid of the evidence".

Participants were required to explain *how* they would solve the scenario using fire. This was to establish the level of expertise a participant held. As Butler and Gannon (2015) hypothesise, expertise represents *how* somebody would use fire in a given situation. An example response provided by a participant was:

> "I would drive the car to a secluded location. Put a rag in the petrol cap, and then set the rag a light with a lighter".

The scoring instructions provided to raters were derived from clinical experience and literature pertaining to expertise in other domains. So, for the example above, the scoring instructions were:

> "Did the participant show a consideration of the location, preferably secluded? Did the participant use accelerant to increase intensity/speed of fire? Did the participant show an awareness of where they were obtaining accelerant? Did the participant make use of materials that were already present at the scene? Did the participant set fire to highly flammable material (e.g. car seats etc.)? Did the participant set multiple ignition points? Did the participant demonstrate an awareness of their own safety (e.g. using a 'wick' or trail to start fire)? Consideration of some/all of these points demonstrates a higher level of expertise".

Raters were asked to give each scenario a score between 0 – 10. Whereby '0' represented no demonstration of expertise and '10' represented a very expert answer. A score of '0' was always awarded if no answer was provided. Raters were invited to use the whole length of the scale, and award a score based on how well the participant's answer matched the explanation given in the scoring instructions.

Raters were allowed to differ by a maximum of four points, as the scale ranged from 0 – 10, and as such represented a gradient approach to rating expertise. A total expertise score, ranging from 0-10, was created for each participant by averaging the two raters' scores, adding that averaged score for all 8 scenarios together, and then dividing by 8. Higher scores indicated a higher level of expertise. The average expertise score for each participant group can be seen in Table 2.

Instances of disagreement regarding the expertise score, similar to the presence/absence of a script, were rectified through the first author facilitating a discussion between the two raters. Interrater agreement for the level of expertise, pre discussion (Kappa = .03, p = .04) and post discussion interrater agreement (Kappa = .04, p = .007; see Table 2) was considered to be a fair level of agreement according to Landis and Koch (1977). However, given that the two raters were allowed to disagree by a total of four points without needing to amend their rating, and Kappa is sensitive to instances of invariance, the absolute level of agreement was also calculated. This was calculated by including all instances whereby raters disagreed by four or less points as agreement on a given scenario, and any instances whereby the raters disagreed by more than four points, on a given scenario, as disagreement. Pre discussion the level of agreement showed that raters agreed on 92% (n = 935) of all scenarios rated, and post discussion agreement showed that raters agreed on 96% (n = 975) of all scenarios rated.

Procedure

All participants were assessed in one-on-one sessions (lasting approximately 45 minutes) so that the first author could read aloud all study materials in order to maximise comprehension. The research was completed in an office either on the prison wing (firesetters and offender comparisons), at the fire station (FSP), or on the University campus (community comparisons). Participants provided written informed consent, key demographic information, and completed the questionnaires and imaginary scenarios. Participants were told that the study was investigating how and why firesetting behaviour occurs. Participants were told that they would be given scenarios and asked to provide some ideas about how they might solve the scenarios.

Ethics

The study was reviewed and approved ethically by the University Research Ethics Committee (REF 20143556). The study asked participants to suggest how they may set an imaginary fire, which could be considered to be asking participants to think in a pro-criminal manner. Therefore, all participants were fully debriefed, with emphasis placed on the negative consequences of firesetting behaviour.

Results

Analytical Approach

Although years in education differed significantly between the four groups, this variable was not correlated with any dependent variable and so was not covaried out for the forthcoming analysis[2]. There were no significant group differences on impression management scores across the groups $F(3, 123) = 2.42$, $p = .07$, $\eta_p^2 = .06$. Furthermore, correcting for impression management is seldom helpful since it removes variance shared with content variables (Mills, Loza, & Kroner, 2003; Uziel, 2010)[3]. Therefore, the following reported results represent scores unadjusted for the effects of impression management. Age, however, was entered as a covariate in the analysis since age of first firesetting conviction is a risk factor for repeated firesetting (Rice & Harris, 1996).

An ANCOVA, with age entered as a covariate, was conducted on the script measure with subsequent Chi-Square tests to investigate the presence or absence of the four scripts. An ANCOVA was also conducted on the expertise measure, with expertise entered as a dependent variable and age entered as a covariate. To compare scores on the Four Fire Factor Scales (Ó Ciardha et al., 2014), and establish the presence of firesetting scripts and expertise, differences between participant groups (i.e., firesetters, offender comparisons, FSP, and

[2] Repetition of the forthcoming analysis with years in education entered as a covariate did not alter the results.
[3] Nevertheless, repetition of the forthcoming analysis with Impression Management entered as a covariate did not alter the results.

community comparisons) were examined using a multivariate analysis of covariance (MANCOVA) with follow up univariate analyses of covariance (ANCOVAs), as well as separate ANCOVAs, and Chi-Square tests of independence. Finally, to investigate the relationship between scripts, expertise, and the Four Fire Factor Scales, zero order correlations were conducted along with two multiple regressions. Four Fire Factor Scales that were significantly correlated with scripts and expertise scores were entered simultaneously as predictors and the number of scripts and expertise as separate dependent variables.

Scripts

Analysis of the total script score using an ANCOVA, with age entered as a covariate, as hypothesised, revealed a significant group effect, $F(3,122) = 7.97$, $p < .001$, $\eta_p^2 = .16$. However, age was not a significant covariate, $F(1,122) = .01$, $p = .91$, $\eta_p^2 = .00$. Subsequent post hoc comparisons, using Bonferroni adjusted alpha levels, revealed that firesetters were rated to hold significantly more scripts than both offender comparisons ($p < .001$, $d = 0.94$) and community comparisons ($p < .02$, $d = 0.75$). FSP could not be differentiated from firesetters on scripts and only held significantly more scripts than offender comparisons ($p < .01$, $d = 0.95$).

In order to establish which scripts may be driving the significant group effect, Chi-Square tests of independence were conducted to establish the presence or absence of the four scripts across firesetters, offender comparisons, FSP, and community comparisons. A significant association was found between groups and the presence of the fire is a powerful messenger script χ^2 $(1, N = 127) = 18.94$, $p < .001$, $\varphi c = .39$. Post-hoc testing using adjusted z scores and Bonferroni adjusted alpha levels highlighted that firesetters were rated as holding the script more often than expected by chance ($p < .05$). Whilst a significant association was also found between groups and the presence of the fire destroys evidence script, ($p = .03$, Freeman-Halton-Test), post hoc analysis could not identify any differences, likely due to the

conservativism of the applied Bonferroni correction. Examination of the data, however, suggested that FSP held higher numbers of scripts than expected by chance in this area (expected n = 31.9, observed n = 34).

A significant association was also found between groups and the presence of the fire as a cry for help script χ^2 (1, N =127) = 7.77, p = .05, φc = .39. Whilst, post hoc analysis could not pinpoint the source of the association, this is, again, likely due to the conservativism of the applied Bonferroni correction. Examination of the data, however, suggested that firesetters and FSP held higher numbers of scripts than expected by chance in this area (expected n = 9.1, observed n = 13; expected n = 9.1, observed n = 12 respectively).

No significant association was found between groups and the presence of the fire is soothing script, χ^2 (3, N =127) = 7.24, p = .07, φc = .24.

Expertise

Analysis of the presence of expertise using an ANCOVA, with age entered as a covariate, revealed a significant group effect, F(3,122) = 25.37, p <.001, η_p^2 = .38. However, age was not a significant covariate, F(3,122) = .03, p = .87, η_p^2 = .00. Subsequent post hoc comparisons, using Bonferroni adjusted alpha levels, revealed that firesetters held a greater level of expertise relative to offender comparisons (p < .001, d = 1.40) and community comparisons (p <.001, d = 1.05). Similarly, FSP also had a greater level of expertise than both offender comparisons (p <.001, d = 1.99) and community comparisons (p <.001, d = 1.59).

The Four Fire Factor Scales

Analysis of the Four Fire Factor Scales using a MANCOVA revealed a significant group effect F(12, 363) = 5.34, p <.001; Pillai's Trace= .45 η_p^2 = .15. Age, F(4, 119) = 5.21, p <.001; Pillai's Trace = 0.15, η_p^2 = .15 was a significant covariate. Univariate analyses,

controlling for age, revealed a significant effect of group on the extent to which participants identified with fire, $F(3, 122) = 14.71$, $p < .001$, $\eta_p^2 = .27$, levels of serious fire interest, $F(3, 122) = 4.09$, $p < .01$, $\eta_p^2 = .09$, and perceived fire safety awareness, $F(3, 122) = 4.42$, $p < .01$, $\eta_p^2 = .10$. However, contrary to predictions, there was no significant effect of group on viewing firesetting as normal, $F(3, 122) = .86$, $p = .47$, $\eta_p^2 = .02$.

Subsequent post hoc comparisons, with Bonferroni adjusted levels revealed that it was FSPs who identified with fire more than firesetters ($p = .001$, $d = 0.94$), offender comparisons ($p < .001$, $d = 1.58$), and community comparisons ($p = .001$, $d = 1.02$). Firesetters' identification with fire was not significantly different from offender or community comparisons. Furthermore, whilst there was a significant group difference in levels of serious fire interest, subsequent post hoc comparisons failed to demonstrate the source of this difference although both firesetters and FSP demonstrated an elevated level of serious fire interest compared to offender comparisons and community comparisons of medium effect (*d*s .55 to .78).

Finally, FSP had significantly higher levels of self-reported fire safety awareness than firesetters ($p < .05$, $d = 0.58$) and community comparisons ($p < .01$, $d = 0.86$), but there was no significant difference between FSP and offender comparisons. Firesetters did not display significantly lower levels of fire safety awareness relative to the offender or community comparisons.

The Relationship between Fire Factors, Scripts, and Expertise

Regression analyses were conducted to identify which of the factors on the Four Fire Factor Scales were able to predict the presence of scripts and expertise. Prior to conducting the regression analyses, zero order correlations were examined (see Table 3). The number of scripts held was significantly associated with Identification with Fire ($p < .01$), and Serious

Fire Interest (p <.05). Furthermore, level of expertise was also significantly associated with both Identification with Fire (p <.01) and Serious Fire Interest (p <.01).

In two subsequent multiple regression analyses, Identification with Fire and Serious Fire Interest were entered simultaneously as predictors with number of scripts and expertise as separate dependent variables. With regards to scripts, Identification with Fire and Serious Fire Interest together accounted for 40% of the variance in script score, F = 11.64, p <.001. Identification with Fire (β = .36, t = 4.13, p <.001) was the only significant independent predictor of the script scores. In relation to expertise, Identification with Fire and Serious Fire Interest together accounted for 49.4% of the variance in expertise score, F = 20.04, p <.001. Both Serious Fire Interest (β = .22, t = 2.74, p <.01) and Identification with Fire (β = .38, t = 4.69, p <.001) were significant independent predictors of the level of expertise.

Discussion

Consistent with previous research in the areas of offending scripts and expertise (Brookman, 2015; Casey, 2015; Cornish, 1994; Day & Bowen, 2015; Gagon, 1990; Huesmann, 1988; Huesmann & Eron, 1984; Nee, 2015; Ó Ciardha, 2015; Topalli, 2005; Topalli, Jacques, & Wright, 2015; Vieraitis, Copes, Powell, & Pike, 2015; Ward & Hudson, 2000; Ward & Siegert, 2002) firesetters, relative to both offender and community comparisons, reported increased fire-related cognitive and behavioural efficacy. When compared to both offender and community comparisons, firesetters held higher levels of fire supportive scripts, and were rated as being more expert in fire misuse. The inclusion of a FSP comparison group was particularly important in this study since it showed that pro-social individuals who work with fire regularly hold a similar profile (although FSP remained indistinguishable from offender comparisons on total number of scripts). These findings are the first to suggest that both those who misuse fire and those who interact with it pro-socially

exhibit cognitive and behavioural characteristics associated with the presence of fire-related scripts and expertise. For the firesetters in this study, script knowledge appeared to revolve around fire being a powerful tool or using fire as a cry for help. For FSP, script knowledge appeared to be concentrated in the areas of fire destroying evidence and fire being used as a cry for help. These differences may reflect variations in the knowledge gained in relation to these scripts (e.g., FSP may have learnt more about fire's destructive properties and have attended large numbers of 'cry for help' firesetting incidents). Furthermore, FSP are likely to have learnt *about* these scripts since—to our knowledge—these FSP did not hold first-hand experience of misusing fire themselves. This suggests that future methods developed to examine the existence of scripts need to develop more sophisticated ways of differentiating between scripts used to guide one's own behaviour and scripts used to guide others' behaviour (i.e., 'self' versus 'other' scripts). With regards to expertise, Nee and Ward (2015) propose that expertise refers to "cognitive processes and consequent behaviour that are demonstrably superior to those new to a given domain and are based on considerable experience and honing of skills over time" (p. 2). FSP are likely to have accumulated considerable amounts of training and direct experience of dealing with the complexities of various fires (e.g., accelerant use, multiple ignition points). When considering the concept of avoiding detection within firesetting expertise, FSP, especially those involved in fire investigation, will also have a wealth of first-hand experience in investigating fires and the methods used to avoid detection. Thus, it is perhaps unsurprising that FSP also appear to have stored highly retrievable information on firesetting in their long-term memory.

Surprisingly, relative to previous research in the area of firesetting (e.g., Gannon et al., 2013; Ó Ciardha et al., 2014), we did not find clear evidence of firesetters scoring significantly higher than offender and community comparisons on fire factors such as identification with fire, serious fire interest, or normalisation of fire. We also did not find

firesetters to be particularly deficit in the area of fire safety awareness relative to these groups. This is surprising, although for serious fire interest we did note that the Bonferroni correction applied may have been conservative since firesetters did endorse higher levels of serious fire interest and the size of this effect was medium. Perhaps most surprising, however, was the fact that the FSP not only scored significantly higher than all groups on their identification with fire, but they also scored similarly to the firesetters on the serious fire interest subscale. As hypothesised, however, FSPs' fire safety awareness was superior relative to both firesetters and community comparisons. It is impossible to determine whether the FSP in this study were drawn to the profession because of an identification or interest in fire, or whether these factors developed or further developed as a result of their occupation. Certainly, exposure to fire and fire safety principles on a daily basis are likely to account for FSPs' elevated levels of identification with fire and superior levels of perceived fire safety awareness.

Taken as a whole, our research shows that fire-related variables are not sufficient for explaining deliberate firesetting behaviour; supporting theoretical approaches suggesting that firesetters have multiple psychological vulnerabilities that contribute to an act of firesetting (e.g., Gannon et al.'s, 2012 Multi-Trajectory Theory of Adult Firesetting [M-TTAF]). Using the M-TTAF, it is plausible to suggest that FSP lack the volume and intensity of other vulnerabilities (e.g., intimacy problems, coping deficits) that interact with fire variables such as identification with fire to produce fire misuse. This suggests that practitioners can be optimistic when treating individuals who identify with fire. This aspect, alone, need not translate into destructive firesetting behaviour. In this respect, tackling other apparent vulnerabilities for firesetting and examining other ways of satisfying identification with fire may be key.

Finally, our research highlighted that there was a relationship between the fire factor scale (i.e., serious fire interest and identification with fire) and scripts and expertise. Namely, scripts were predicted by the extent to which an individual identified with fire, and expertise was predicted by both serious fire interest and identification with fire. Furthermore, the amount of variance in scripts and expertise explained was relatively high (40% and 49.4% respectively). The idea that identification with fire was able to predict both scripts and expertise is consistent with Butler and Gannon's (2015) conceptualisations of these concepts. Scripts are proposed to act as behavioural guides, explaining why somebody may use fire in a given situation. Therefore, it is reasonable to suggest, in line with research in clinical psychology regarding the development of behaviour (e.g., social learning theory, classical conditioning, attachment theory; Bandura, 1977; Bowlby, 1969, 1973; Schachtman & Reilly, 2011) that individuals who hold higher levels of identification with fire would develop more scripts about its use. Second, expertise refers to a superior ability in a given domain developed through engaging in many hours of deliberate practice. Thus, such engagement is highly likely to occur as a result of higher levels of fire identification and serious fire interest.

The results of these novel studies should be interpreted with caution for two main reasons. First, the scenarios used to examine scripts and expertise required participants to engage in hypothetical activities, which are substantially different from actual behaviour and could be perceived as being transparent. Nevertheless, the measures employed were adapted from previously successful methodologies used to study these concepts (Cazalis et al., 2001; Nee & Taylor, 1988; Taylor & Nee, 1988). The replication and extension of these findings is crucial. Implicit measures in which firesetters and non-firesetters are unknowingly timed when selecting and choosing the items needed to start a fire could be illuminating.

Second, the current study only included adult male participants. Therefore, the scripts and expertise that are evident within this sample may not be applicable to other types of

firesetters (e.g., female or mentally disordered firesetters). However, the results show promise; suggesting that firesetters do hold scripts and demonstrate expertise at a greater level than that of non-firesetting offenders. Consequently, we can begin to suggest that these concepts may not merely be the result of general criminality, but are in fact specific to firesetters and those who work closely with them (i.e., FSP).

A further limitation of this study was that the presence of a gradient of expertise as proposed by Nee and Ward (2015) and number of scripts held is determined by previous firesetting convictions/history for firesetters or years of service for FSP. That is to say would one-time firesetters or FSP with fewer years of experience hold less scripts and demonstrate less expertise than those firesetters who have set multiple fires or FSP with more years of service, where a higher number of scripts and superior level of expertise would be expected? This would be important to investigate in any future research.

A final limitation relates to the questionable reliability exhibited on the fire safety awareness and normalisation of firesetting subscales of the Four Fire Factor Scale (Ó Ciardha et al., 2016). However, further analysis showed that this might have been due to FSP answering in a way that contravened expected responses. For example, with regards to the Firesetting Safety Awareness subscale, most FSP answered ‘strongly disagree’ to the item ‘Parents should spend money on buying a fire extinguisher’. Presumably, this is because FSP would argue that civilians should not attempt to fight the fire. However, the general assumption of the public (and of this scale) is that it would be beneficial to have a fire extinguisher in one’s home. Such contradictions in responding may well account for the poor reliability of these scales.

In summary, the results of this study provide initial evidence to suggest that firesetters hold specific fire-related scripts and expertise that should be considered when assessing and treating firesetters within secure establishments. Our findings regarding FSPs’ elevated

scripts, expertise, and fire factors are also tantalising. These results suggest that future research should employ comparison groups such as FSP and examine the key factors that distinguish these individuals from those who misuse fire deliberately. Whatever the case, our results suggest that practitioners can be optimistic when treating individuals who hold high levels of fire-relevant variables since this aspect, alone, need not translate into destructive firesetting behaviour.

Table 1.
Demographic Information

Variable	Firesetter *N* = 34	Offender Comparison *N* = 34	Fire Service Personnel (FSP) *N* = 34	Community Comparison *N* = 25	$F(3, 120)$ $\chi^2(3, N = 127)$ $\chi^2(1, N = 68)$
Age (Years) *M (SD)*	35.41 (10.77)	37.03 (12.05)	43.68 (7.46)	37.44 (15.31)	3.41*
Formal Education (Years) *M (SD)*	9.24 (3.46)	10.09 (3.31)	12.09 (1.46)	14.16 (3.28)	15.87**
Ethnicity					
White UK/Irish % (*n*)	82.4 (28)	58.8 (23)	97.10 (33)	96.00 (24)	21.52**
BAME % (*n*)	17.60 (6)	41.20 (14)	2.90 (1)	4.00 (1)	
Engagement with Mental Health Services					
Yes % (*n*)	79.40 (27)	20.60 (7)	20.60 (7)	8.00 (2)	44.32**
No % (*n*)	20.60 (7)	79.40 (27)	79.40 (27)	92.00 (23)	
Ever Attended Offender Behaviour Programmes					
Yes % (*n*)	82.40 (28)	76.50 (26)	-	-	.36
No % (*n*)	17.60 (6)	23.50 (8)			

*$p < .05$ **$p < .001$
Note. Participants' engagement with mental health services was measured by asking participants "Have you ever engaged with mental health services before?".

Table 2

Comparison of Means and Estimated Marginal Means on Outcome Measures

Measures	Firesetter *N* = 34 *M (SD)*	Offender Comparison *N* = 34 *M (SD)*	Fire Service Personnel *N* = 34 *M (SD)*	Community Comparison *N* = 25 *M (SD)*	$F(3, 120)$ $\chi^2(1, N = 127)$	α	κ
Fire-Related Measures							
Identification with Fire (Maximum Score = 55)	18.56 (1.07)[b]	14.61 (1.06)[b]	24.70 (1.08)[a]	18.40 (1.23)[b]	14.71***	.84	-
Serious Fire Interest (Maximum Score = 35)	11.99 (.76)	9.20 (.75)	12.09 (.77)	9.42 (.88)	4.09*	.82	-
Firesetting as Normal (Maximum Score = 35)	18.32 (.70)	16.94 (.69)	17.83 (.71)	17.07 (.80)	.86	.60	-
Fire Safety Awareness (Maximum Score = 30)	10.76 (.46)[bc]	10.08 (.45)[abc]	8.92 (.47)[a]	11.32 (.53)[bc]	4.42**	.30	-
Script Measure							
Total Script Score (Maximum Score = 4)	2.35 (.15)[a]	1.47 (.15)[b]	2.26 (.16)[ac]	1.64 (.18)[bc]	7.97***	-	.93**
Expertise Score (Maximum Score = 10)	3.32 (.23)[a]	1.53 (.23)[b]	4.05 (.23)[a]	1.90 (.26)[b]	25.37**	-	.04*

Note. Higher scores on the Fire Safety Awareness Scale indicated less perceived fire safety awareness. * p <.05, ** p < .01, *** p < .001. Superscripts that share the same letter do not significantly differ.

Table 3
Correlations Between Variables

	Script	Expertise	Serious Fire Interest	Identification with Fire	Fire Safety Awareness	Firesetting as Normal
Script	------					
Expertise	.54**	------				
Serious Fire Interest	.21*	.33**	------			
Identification with Fire	.39**	.45**	.29**	------		
Fire Safety Awareness	.28	.04	.31**	.02	------	
Firesetting as Normal	.08	.17	.24**	.01	.03	------

* p <0.05 **p <0.01

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