

The effectiveness of psychological interventions for adults who set fires: A systematic review

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ABSTRACT

Firesetting is an international public health concern with significant consequences for individuals and society. However, the adult firesetting literature is limited, especially for treatment provision. PsycINFO, EMBASE, MEDLINE Complete, PsycArticles, Web of Science, Scopus, ProQuest Central, and CINAHL were searched for peer-reviewed quantitative studies considering psychological interventions targeting deliberate firesetting in adults and subject to a narrative synthesis. Of the 4542 identified studies, 14 ($n = 343$ firesetters) met the broad inclusion criteria. Most studies comprised single-case or small-scale evaluations with highly selected samples, heterogeneous needs, and methodological limitations (e.g., lacking experimental control or reliable evaluation methods). Cognitive behaviour therapy (CBT) in a group format is currently the most evaluated intervention in UK secure living environments. High-quality studies showed that CBT group-based interventions improved firesetting-specific outcomes (i.e., problematic interest and associations with fire) and psychological vulnerabilities associated with firesetting (e.g., anger expression or offence-supporting attitudes) among prisoners and mental health inpatients. The paucity of high-quality evaluation studies and the considerable heterogeneity of the available study designs make it difficult to compare the existing interventions and draw reliable conclusions about what works for whom. Larger prospective longitudinal studies are needed internationally with multi-site designs, follow-up recidivism data in the community, and control groups to determine whether these interventions can effectively reduce firesetting risk.

1. Introduction

1.1. Prevalence and impact of adult firesetting

Deliberate firesetting is a worldwide public health concern with considerable psychological, financial, and social impacts on individuals and society. The consequences of deliberate firesetting are associated with severe injuries, fatalities, environmental damage, psychosocial problems, and societal financial costs. For example, government data in England show that Fire and Rescue Services attended 69,786 deliberate fires between April 2021 and March 2022, translating into approximately 123.5 deliberate fires per 100,000 inhabitants (Home Office, 2023a). This resulted in 43 fire-related fatalities and 865 non-fatal casualties, with 393 victims of firesetting requiring hospital treatment (Home Office, 2023b). However, in the same year, only 1379 individuals were convicted of criminal damage and arson (Ministry of Justice,

2022). This data implies that few individuals who set fires come to the attention of the legal system and are successfully prosecuted in criminal courts.

Considering the global (Western) perspective, estimations of arson incidents range from 12.3 to 200 per 100,000 inhabitants across the United States of America (USA), Canada, and Australia (convicted or unconvicted; Federal Bureau of Investigation, 2022; Mayhew, 2003; Smith et al., 2014; Statistics Canada, 2022). The differing firesetting reporting systems and definitions could primarily explain the notable variation across countries (Gannon et al., 2022; Meacham, 2020). However, Smith et al. (2014) argued that arson incidents are under-reported, estimating that for every reported arson incident, two additional incidents are never reported to the police. Acts of firesetting are interchangeably described as arson, firesetting, or pyromania. One of the most commonly reported definitions conceptualises firesetting as all acts of deliberate fires which have the potential to cause harm to a

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person or damage property and are not limited to legal convictions (i.e., arson) or mental states (i.e., pyromania; Dickens & Sugarman, 2012; Gannon & Pina, 2010).

In research, the prevalence of firesetting behaviour seems to range from 1 % to 17.8 % in community samples in the UK and USA, with the large spread likely being explained by studies using differing recruitment methods, data collection approaches, and operational definitions of arson (Barrowcliffe & Gannon, 2015, 2016; Blanco et al., 2010; Gannon & Barrowcliffe, 2012; Vaughn et al., 2010). Higher prevalence rates have been reported for individuals with mental health conditions, intellectual disabilities (ID), autism, and criminal history ranging from 1.4 % to 66.6 % in a number of Western samples (Alexander et al., 2015; Burns et al., 2003; Coid et al., 2001; Devapriam et al., 2007; Fazel & Grann, 2002; Hollin et al., 2013; Long et al., 2015). Similarly, these variations exist based on differing definitions, assessments, and sampling approaches (Collins et al., 2021; Tyler & Gannon, 2012). Regardless, firesetting is an internationally recognised public health concern that requires specialist treatment provisions (Tyler et al., 2019). Evidence shows that individuals who deliberately set fires are at higher risk of engaging in further deliberate firesetting (20 %), criminal arson (8–10 %), and other non-fire related offences (57–66 %; Sambrooks et al., 2021). The impact of such behaviour is associated with enormous financial costs to society (Arson Prevention Forum, 2017).

Firesetting in child and youth offenders is relatively well-researched (Johnston & Tyler, 2022; Lambie & Randell, 2011; MacKay et al., 2012; Perks et al., 2019). Firesetting was historically considered a youth phenomenon, and a focus was placed on developing specialist firesetting psychosocial programmes for this population (Dickens & Sugarman, 2012). Recent reviews show some evidence of pure or multi-component Fire Safety Education (FSE) programmes and Cognitive Behaviour Therapy (CBT) in reducing the risk of firesetting in young people (Johnston & Tyler, 2022; Perks et al., 2019). However, there have been more limited efforts to develop interventions to address the needs of adults, with adult firesetting often being considered a neglected research topic (Gannon & Pina, 2010; Palmer et al., 2007; Tyler et al., 2019). Yet, understanding this population's treatment needs and risks is important.

1.2. Psychological theories on adult firesetting

In the adult firesetting literature, an emphasis has been placed on the profile, motives, risk factors and etiological features for repeat firesetting. This aimed to help develop psychological theories to guide reliable assessment tools and identify appropriate treatment needs (Gannon et al., 2012; Gannon & Pina, 2010). The most predominant theories in the area included the Dynamic Behaviour Theory (Fineman, 1980, 1995) and Functional Analytical Theory (Jackson et al., 1987). Both Jackson et al. (1987) and Fineman (1995) supported the idea that repeat firesetting might be a learned behaviour that occurs in the context of a complex interplay between predisposing factors (i.e., dysfunctional developmental experiences, poor social strategies, and dissatisfaction with self or others), internal or external triggering events (i.e., unbearable feelings and cognitions) and perpetuating factors (i.e., relief from unpleasant internal emotions or environmental change). Such perpetuating factors, either positive (i.e., eliciting care from others) or negative (i.e., punishment), can work as reinforcers of the firesetting behaviour as the tool to meet personal needs (Ó Ciardha & Gannon, 2012). While these theories provide a broad explanation of firesetting, they have been criticised for not explaining the impact and interaction of a wide range of fire-related risk factors in more detail.

More recently, Gannon et al. (2012) developed the Multi-Trajectory Theory of Adult Firesetting (M-TTAF), a comprehensive overarching framework of adult firesetting, which integrates principles of previous theories in a multi-factor theory. The M-TTAF argues that biopsychosocial, cultural, and dysfunctional early life experiences with primary caregivers may lead a person to develop certain psychological vulnerabilities (i.e., problematic interests, beliefs, or associations with

fire; firesetting specific or general offence-supportive attitudes; self and emotional regulation difficulties; and poor communication and social skills). During the transition from childhood to adulthood, these psychological vulnerabilities can be triggered, moderated, and reinforced by life events or internal experiences, resulting in a chronic and enduring risk of repeat firesetting (critical risk factors). Furthermore, Gannon et al. (2012) described five key trajectories of deliberate firesetting behaviour (i.e., fire interest, emotional expression/need for recognition, antisocial, grievance, and multifaceted trajectories) that derive from the interaction between psychological vulnerabilities and critical risk factors.

All four clusters of psychological vulnerabilities presented by Gannon et al. (2012) have been supported by research with certain cohorts of firesetters (e.g., those in forensic or prison services). Specifically, adult firesetters presented with a more problematic interest or identification with fire, limited fire awareness, communication or social deficits, and self and emotional regulation issues (particularly around anger arousal and an increased experience of anger to perceived provocation) when they were compared with matched samples of other offenders (Gannon et al., 2013; Sambrooks et al., 2024; Wilpert et al., 2017). Yet, there is limited empirical testing and understanding of the risk factors or criminogenic needs associated with firesetting and its repetition (Sambrooks et al., 2024).

1.3. Aims of the current review

Published reviews that include a section on adult firesetting treatment provision have been limited to individuals with ID or autism (Collins et al., 2021; Curtis et al., 2012; Lees-Warley & Rose, 2015). To date, only one published systematic review (Curtis et al., 2012) and one unpublished thesis (Hughes, 2012) have systematically synthesised the evidence of adult firesetting interventions. However, these were conducted over a decade ago when only a few evaluation studies existed (Curtis et al., 2012; Gannon & Pina, 2010; Palmer et al., 2007). Over the past 15 years, practitioners and researchers have had greater opportunity to develop specialist firesetting interventions for adults and address fundamental methodological limitations in light of theories such as the M-TTAF. Moreover, the review by Curtis et al. (2012) had a limited search strategy – using only “arson” and “firesetting” – and focused on individuals of all ages with disabilities. The authors concluded that the few studies included were not well-designed to accurately estimate the effectiveness of firesetting interventions. Finally, while more recent reviews (e.g., Gannon et al., 2022) provide a broad overview of adult firesetting interventions and a description of how these developed, these lack a systematic synthesis, comparison, and evaluation of the methodological quality, risk of bias, and effectiveness of these interventions. Thus, an up-to-date systematic synthesis and comprehensive literature evaluation on psychological interventions for adult firesetters seems important.

To the authors' knowledge, no published systematic review has been conducted exclusively on psychological interventions for adult firesetters. Hence, the current review aims to provide a systematic and comprehensive narrative synthesis of all published evaluation studies on interventions targeting adult firesetting. Subsequently, this review will investigate outcomes reported for adults participating in such interventions, evaluate their effectiveness and scientific integrity, and discuss implications for research and practice.

2. Method

2.1. Protocol registration

The protocol of this systematic review was in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009) and was pre-registered on PROSPERO (registration number: CRD42022328229).

2.2. Eligibility criteria

The inclusion criteria concerned studies that (a) considered psychological interventions targeting deliberate firesetting or associated criminogenic needs in adult firesetters, (b) were peer-reviewed and available in English, (c) used quantitative measures to evaluate the effectiveness of such interventions or used mixed methods analyses, and quantitative data could be extracted, (d) recruited adults (aged 18 and over) with a history of firesetting behaviours (with or without arson convictions). Studies were excluded from the review if they (a) were not available in English or full text, (b) were not subject to peer review (e.g., unpublished manuscripts or service evaluations, theses, book chapters, conference presentations, websites, or blogs), (c) used only qualitative evaluations, (d) recruited participants younger than 18 years old or mixed samples where the differentiation of the adult sub-sample was not possible, (e) evaluated pharmacological treatments or general interventions which were not specific to firesetting or associated criminogenic needs (Gannon et al., 2012), (f) did not differentiate firesetters from other offenders, or (g) reported general service outcomes instead of specific interventions.

2.3. Search strategy and study selection

An initial scoping review was conducted to identify terms commonly used in the literature to describe firesetting (e.g., Collins et al., 2021; Johnston & Tyler, 2022). The complete search strategy can be found in the Appendix; alternative search terms were generated for “intervention”, “arson”, “effectiveness”, and “adults”. In short, studies were identified through a systemic online search of PsycINFO, EMBASE, MEDLINE Complete, PsycArticles, Web of Science, Scopus, ProQuest Central, and CINAHL Complete in January 2023 by the first author (EK). No restriction on the year of publication was applied to provide a comprehensive review of all interventions described in the literature to target adult firesetting and understand how the conceptualisation of firesetting and treatment provision has evolved over time (Gannon et al., 2022). EK and AS independently screened all titles, abstracts, and full-text studies. The agreement rates between the two screeners were 85.62 % for the title, 89.51 % for the abstract, and 97.12 % for the full-text articles screening. Consensus between the two reviewers (100 % agreement) was achieved, and all the discrepancies were resolved through discussion. Additionally, the authors of two conference presentations were emailed requesting clarification about any publications. However, a reply has yet to be received; therefore, these studies were not included in our review. Finally, reference lists, forward citations of all included studies, and relevant reviews were hand-searched by EK.

2.4. Identification of studies

Of the identified 4542 studies, 3030 were considered in the initial review after removing duplicates. Following the screening of titles and abstracts, 2701 studies were excluded, and the full texts of 91 studies were located and retrieved for further review. 26 additional studies were also identified and retrieved by hand-searching the included studies' reference lists and their forward citations. Overall, 14 studies met the inclusion criteria and were included in the final review.

2.5. Data extraction

Data extraction was conducted independently by two reviewers, EK and AS. Relevant study characteristics were extracted, including details for the authors, country, service, study design, recruitment, sample composition, and methodology quality (strengths and limitations). Firesetting intervention data concerned firesetting types, criminal history, modality used, intervention characteristics (core components, format, length, and resources), treatment provider characteristics (e.g., qualifications or training), evaluation methods (e.g., psychometrics or

recidivism), and key findings. Fire-related factors (e.g., interest, beliefs, or associations with fire) were reported as primary outcomes and psychological vulnerabilities or criminogenic needs (e.g., emotion regulation, social/communication competencies, or offence-specific attitudes) that have been hypothesised to be associated with firesetting according to M-TTAF (Gannon et al., 2012) were reported as secondary outcomes.

2.6. Methodological quality appraisal

The quality of each study was assessed independently by two reviewers, EK and AS, using a standardised methodological quality checklist of Downs and Black (1998). This checklist has been widely used in healthcare intervention reviews to appraise heterogeneous quantitative studies (e.g., Lees-Warley & Rose, 2015). The checklist consists of 27 items exploring reporting information, biases of the measurement/intervention and confounds (internal validity), external validity, and statistical power. The total score is 28, with 25 items being assessed with 1 (Yes/compliant) or 0 (No/non-compliant); one item in the reporting subscale being scored as 2 (Yes/fully compliant), 1 (partially compliant) or 0 (No/non-compliant); and one item about power receiving scores 1 (sufficient power) or 0 (insufficient power). Greater scores indicated higher compliance and better methodological quality. Corresponding quality levels have been reported as poor (≤ 14), fair (15–19), good (20–25), and excellent (26–28; Hooper et al., 2008). Discrepancies between the two reviewers (84.2 %) were resolved through discussion (Fig. 1).

Given the limited studies available, all identified studies were included in the current review irrespective of their quality appraisal ratings. This decision also allowed us to reflect on the methodological limitations and challenges in conducting research in this population, learn from them, and discuss how to address them. Only three (21.4 %) studies met good standards of methodological quality, reporting a low risk of bias, with three studies (21.4 %) being rated as fair and most studies ($n = 8$, 57.2 %) being rated as poor quality (Table 1). This implies a high risk of confounding effects, methodological biases, and poor internal and external validity. Hence, any conclusions derived from the narrative synthesis of the evidence should be carefully interpreted.

3. Results

3.1. Sample characteristics

A total of 343 adults with a history of deliberate firesetting were included across the 14 studies. Of those, 253 firesetters received an intervention targeting firesetting or related psychological factors, and 85 received treatment as usual (TAU) in only two studies (Gannon et al., 2015; Tyler et al., 2018). In one study, 5 participants received the control treatment and the main intervention in reverse order (Rice & Chaplin, 1979). Across the 14 studies, participants were sampled from high/maximum secure mental health inpatient ($n = 5$, 35.7 %), prison ($n = 4$, 28.6 %), low-secure ($n = 3$, 21.4 %), medium-secure ($n = 2$, 14.3 %), and specialist mental health ($n = 1$, 7.1 %) services. One study recruited firesetters from low-security prisons and also a community sample (Pearson et al., 2022). The sample of one study, Taylor et al. (2006), overlapped with a larger sample from a study by the same authors Taylor et al. (2002), reporting a more detailed analysis of a sub-sample and follow-up recidivism rates and, therefore, it was included in our analysis.

3.2. Demographic, clinical, and criminogenic characteristics

The gender of the participants was reported in all studies (74 % males, 21.8 % females, 4.2 % unknown), ethnicities in six (on average 92.75 % were White), mean ages in eleven (aggregated mean age of 34.13 years), and age ranges in nine studies (17–74 years). Regarding diagnosis, six studies (42.9 %) included participants with ID, five (35.7

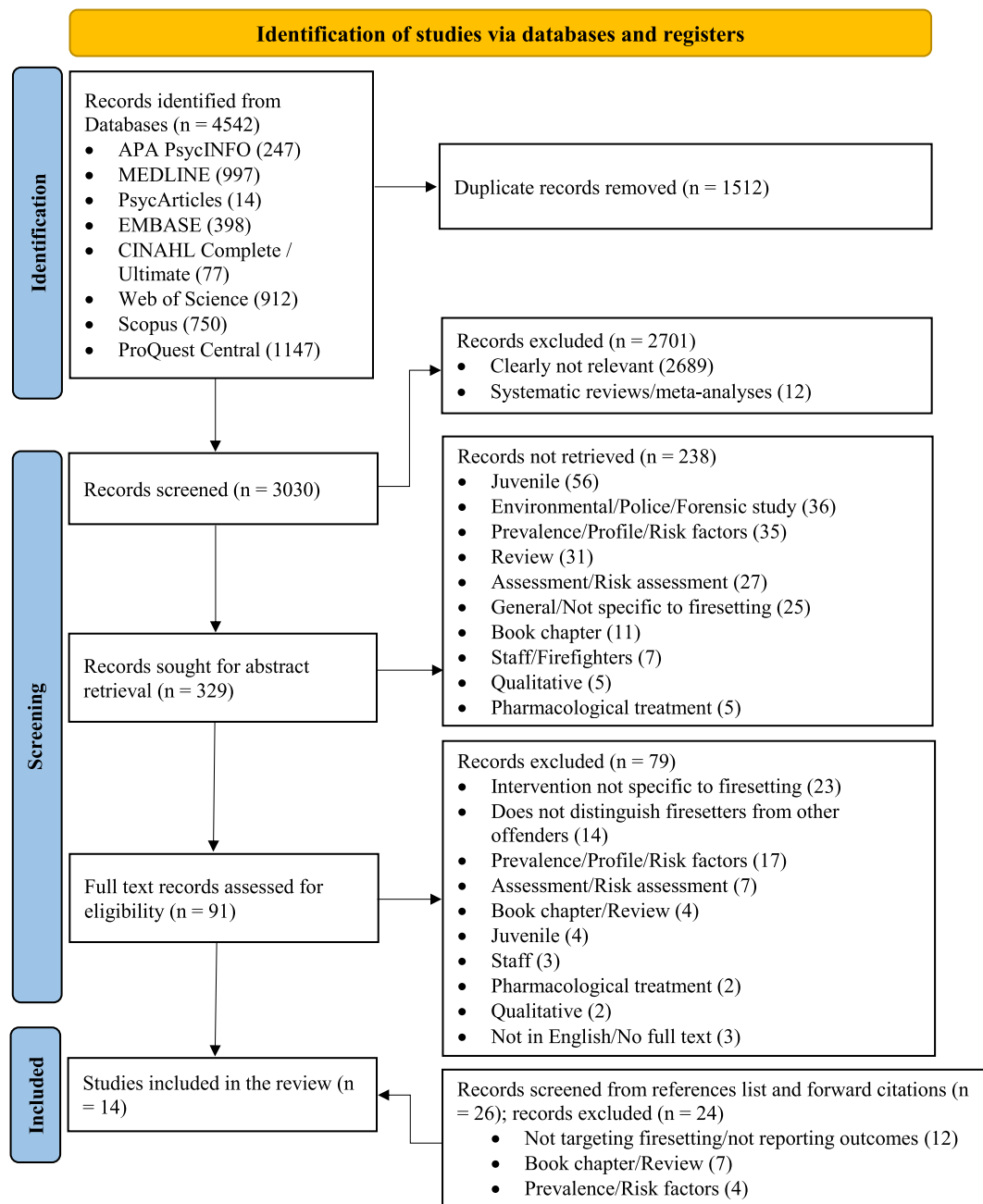


Fig. 1. Prisma flowchart including review's inclusion and exclusion criteria (n = 14).

%) psychiatric disorders, four (28.6 %) psychopathy, three (21.4 %) personality disorders, five (35.7 %) did not report any diagnostic information and five studies (35.7 %) sampled participants with more than one diagnosis. Furthermore, twelve studies (85.7 %) included participants convicted of arson, nine (64.3 %) included participants with additional non-fire-related offences, two (14.3 %) included participants without conviction (Swaffer et al., 2001; Winters et al., 2022), and one study (7.1 %) did not provide information on conviction status (Royer et al., 1971).

3.3. Countries

Of the 14 included studies, ten (71.4 %) were conducted in the UK, three (21.4 %) in the USA, and one (7.1 %) in Canada. In the UK, four single case studies adopted a Dialectical Behaviour Therapy (DBT) adapted approach (Ashworth et al., 2017), art therapy (Delshadian,

2003), CBT (Swaffer et al., 2001), or CBT combined with covert sensitisation and surgery for facial disfigurement (Clare et al., 1992). In the larger UK studies (n = 6), five adopted the CBT framework, and only one evaluated the effectiveness of a FSE programme (Pearson et al., 2022). Only single case studies have been reported in the USA, with two using behavioural conditioning, including covert sensitisation (Lande, 1980) and aversion therapy (Royer et al., 1971) and one study using a CBT approach (Winters et al., 2022). In the only Canadian study, authors used social skills training in a small-scale study (Rice & Chaplin, 1979).

3.4. Study designs

Of the 14 studies, seven (50 %) were single case studies, four (28.6 %) were AB designs, and three (21.4 %) were non-randomised quasi-experimental control trials. Only small (1–50 participants; 78.6 %) and medium (50–300 participants; 21.4 %) size studies were identified. Only

Table 1
Quality appraisal of the included studies.

| Study | Downs and Black checklist (1998) | | | | | Total score (/28) | Quality level |
|-------------------------|----------------------------------|------------------------|-----------|------------------|------------|-------------------|---------------|
| | Reporting (/11) | External Validity (/3) | Bias (/7) | Confounding (/6) | Power (/1) | | |
| Annesley et al. (2017) | 7 | 1 | 3 | 2 | 0 | 13 | Poor |
| Ashworth et al. (2017) | 9 | 1 | 3 | 3 | 0 | 16 | Fair |
| Clare et al. (1992) | 7 | 1 | 5 | 3 | 0 | 16 | Fair |
| Delshadian (2003) | 1 | 1 | 0 | 0 | 0 | 2 | Poor |
| Gannon et al. (2015) | 11 | 3 | 5 | 3 | 1 | 23 | Good |
| Lande (1980) | 6 | 0 | 4 | 1 | 0 | 11 | Poor |
| Pearson et al. (2022) | 10 | 3 | 5 | 3 | 1 | 22 | Good |
| Rice and Chaplin (1979) | 7 | 1 | 4 | 2 | 0 | 14 | Poor |
| Royer et al. (1971) | 3 | 1 | 0 | 1 | 0 | 5 | Poor |
| Swaffer et al. (2001) | 4 | 1 | 1 | 2 | 0 | 8 | Poor |
| Taylor et al. (2002) | 7 | 1 | 2 | 2 | 0 | 12 | Poor |
| Taylor et al. (2006) | 7 | 3 | 4 | 3 | 0 | 17 | Fair |
| Tyler et al. (2018) | 10 | 3 | 5 | 3 | 1 | 22 | Good |
| Winters et al. (2022) | 6 | 4 | 1 | 1 | 0 | 6 | Poor |

three studies (21.4 %) included a control group (Gannon et al., 2015; Rice & Chaplin, 1979; Tyler et al., 2018). Some authors attributed the lack of control groups to ethical issues of withholding patient treatment (Annesley et al., 2017) or the low number of firesetters available (Pearson et al., 2022; Taylor et al., 2002, 2006). Finally, only half of the studies (n = 7) performed statistical analyses.

3.5. Intervention type

Five studies (35.7 %) described general psychological interventions adapted to address psychological vulnerabilities and criminogenic needs associated with firesetting. Nine studies (64.3 %) evaluated the effectiveness of specialist firesetting interventions (Table 2). Most studies (n = 10, 71.4 %) utilised a group intervention based on CBT (n = 7), DBT (n = 1), FSE (n = 1), and social skills training (n = 1). Participants received additional individual sessions or interventions in five group-based interventions (35.7 %). Only six studies (42.9 %) described individual interventions without additional group intervention.

3.6. General interventions

3.6.1. Aversion conditioning therapy

Three single-case studies described behavioural conditioning. Participants who received aversion conditioning therapy (Royer et al., 1971) and orgasmic reconditioning combined with covert sensitisation (Lande, 1980) presented fewer firesetting incidents and related factors (e.g., sexual arousal or general interest) following the condition. One participant's self-control for firesetting was also increased following assisted covert sensitisation intervention (Clare et al., 1992).

3.6.2. Social skills training

Rice and Chaplin (1979) evaluated the effectiveness of a social skills group compared to TAU. Despite their small sample, the authors found that male firesetters with low to above-average intelligence developed effective communication and social skills following this group.

3.6.3. Art therapy

Delshadian (2003) reported the delivery of art therapy to a female prisoner convicted of arson. The author noted that the patient's firesetting and self-harm incidents were reduced, with the patient developing insight into her firesetting. However, the study did not include standardised evaluation measures and failed almost all the methodological quality requirements.

3.6.4. Dialectical behaviour therapy

Ashworth et al. (2017) reported implementing a DBT-adapted programme on a male inpatient with mild ID and personality disorder. The authors noted a variation in the treatment outcomes; however, fire-

specific outcomes were not reported.

3.7. Specialist firesetting interventions

3.7.1. Group-based cognitive behaviour therapy

Swaffer et al. (2001) presented a participant who attended a structured group-based intervention built on Jackson et al.'s (1987) functional analysis theory and CBT, reporting improvements in the participant's social interaction and emotion regulation. Adopting the same theoretical framework, a multifaceted and structured CBT group intervention was designed for adults with ID (Northgate Firesetters Treatment Programme; NFTP). Taylor et al. (2002) first evaluated the NFTP in 14 inpatient firesetters with ID. They reported statistically significant improvements in fire interest and attitudes, anger, emotional expression, understanding of victim issues and risk, overall goal attainment score, self-esteem, and development of coping strategies following the completion of the group. While gender-specific analyses showed a slight improvement in a sub-group of six female inpatients who completed the same group, five were discharged to supported living placements, and there were no reports of firesetting for at least two years (Taylor et al., 2006).

Gannon et al. (2015) reported piloting and evaluating a standardised, specialist CBT group treatment with accompanying individual sessions (Firesetting Intervention Programme for Prisoners; FIPP) in 54 incarcerated male firesetters. FIPP was developed based on contemporary offending rehabilitation theories, including the Good Lives Model (Ward & Stewart, 2003), the M-TTAF (Gannon et al., 2012), and the Risk Need Responsivity (RNR) Model (Andrews & Bonta, 2010). A battery of standardised psychometrics showed that FIPP participants, compared to the TAU participants, significantly improved their self-reported problematic interest and associations with fire, attitudes towards violence and antisocial behaviour, ability to regulate their anger effectively, and internalised locus of control. All these improvements were maintained three months post-treatment. Tyler et al. (2018) described implementing and evaluating an adapted version of this CBT treatment programme in 52 male and female mental health inpatients (Firesetting Intervention Programme for Mentally Disordered Offenders; FIP-MO; Gannon & Lockerbie, 2014). The evaluation showed that the FIP-MO participants significantly improved their fire-specific outcomes concerning interest, attitudes and associations with fire, and anger expression compared to the TAU group.

3.7.2. Individual cognitive behaviour therapy

Clare et al. (1992) developed and implemented a comprehensive CBT-based treatment package on a 23-year-old male firesetter with a mild ID. Subjective and observational assessments indicated clinical improvements in his coping and interpersonal skills, emotional expression, and firesetting behaviour for up to 48 months. Winters et al. (2022)

Table 2
Studies evaluating the effectiveness of psychological interventions for adult firesetters.

| Authors, year, & country | Setting | Sample characteristics | Study design | Intervention | Control group | Outcome measures | Key findings | |
|---------------------------------------|--|---|--------------|---|--|--|---|---|
| | | | | | | | Fire-specific outcomes | Secondary outcomes |
| Group interventions | | | | | | | | |
| Rice and Chaplin (1979) Canada | Maximum security psychiatric facility | 10 male inpatients, divided into two groups (7 had varied arson convictions, and 5 were medicated). Group 1 (N = 5): mean age = 22; diagnosed with PD and average or above-average IQ; an average of 1 previous admission; 16 months of current admission. | NRCT | Social skills training (8 sessions) and control treatment for attention and expectancy of change (8 sessions). 2 h sessions delivered twice a week for 4 weeks with 2 facilitators. Group 1: social skills training followed by control treatment; participants modelled in the videotaped role-plays and received feedback from their peers. Group 2: participants received the same treatments in the reverse order, but therapists served as models and provided feedback. Participants were rewarded for participating (token economy). | Group 2 (N = 5): mean age = 32; mild to borderline ID; 3 had schizophrenia, 1 ID, and 1 PD; an average of 5 previous admissions; 41 months of current admission. | Videotaped role-play assessments with actors before, between, and after both groups. Rated by blinded assessors in anxiety, assertion, empathy, and verbal skills. Assertiveness questionnaires. Recidivism at 1-year follow-up. | No reports or suspicions of firesetting for 9 participants since their discharge (average time = 18 months). All participants were released into the community, and only one was readmitted because of a minor fire (taken from Rice & Quinsey, 1980). | Group 1: Social skills sig. increased after the social skills group ($p < 0.05$) and maintained after the control treatment ($p < 0.05$). No differences before and after the control treatment ($p > 0.10$). Group 2: Social skills sig. increased before and after both treatments ($p < 0.05$) and before and after the social skills group ($p < 0.01$). There were no differences in social skills before and after the control condition ($p > 0.10$). |
| Taylor et al. (2002) UK | Low-secure ID forensic inpatient service | 14 inpatients (8 males and 6 females); mean age of 33.7 (range 20–48 years); mild-borderline ID (FSIQ range 64–84); all participants were convicted of arson and were under the MHA. | AB | Northgate Firesetters Treatment Programme (NFTP) based on Jackson's (1987) functional analysis theory and CBT. 40 2 h group sessions delivered twice weekly by a psychologist and nurse following a structured therapist's manual over 6 months. Participants were divided into one female group (n = 6) and two male groups (4 in each). | N/A | FIRS FAS GAS NAS CFSEI-2 BDI-SF | FIRS & FAS: 10 of 14 participants sig. improved ($p < 0.05$). | GAS: Total score ($p < 0.001$) and 3 subscales were sig. improved: victim issues ($p < 0.001$), emotional expression ($p < 0.05$), and understanding of risk ($p < 0.005$). NAS: only the total score was sig. improved ($p < 0.05$). CFSEI-2: Total score, general and personal self-esteem scores were sig. improved ($p < 0.05$). BDI-SF: No sig. changes. |

(continued on next page)

Table 2 (continued)

| Authors, year, & country | Setting | Sample characteristics | Study design | Intervention | Control group | Outcome measures | Key findings | |
|---|---|---|--------------|---|---------------|--|---|---|
| | | | | | | | Fire-specific outcomes | Secondary outcomes |
| Taylor et al. (2006) UK A sub-group of the Taylor et al. (2002) | Single-sex low ID secure forensic service | 6 female inpatients (mean age = 34.4 years); mild-borderline ID (FSIQ mean = 74.9, range 64–82); dual psychiatric diagnosis; arson convictions and under the MHA (average length of admission = 3.1 years). | AB | NFTP female-only group, as described in Taylor et al. (2002) study. | N/A | GAS FIRS FAS NAS CFSEI-2 BDI-SF Therapist rating scales after each session. Recidivism rate 2-year follow-up. | FIRS & FAS: no sig. change – considerable variation in individual participants' scores. 5 participants were discharged to community placements with no reports of firesetting at 2-year follow-up. Some participants seemed to justify and rationalise instead of challenging their firesetting behaviours. | GAS: sig. improved ($p = 0.023$). NAS, CFSEI-2, and BDI-SF all improved but not significantly. All participants completed the programme; >98 % attendance. Only one participant needed individual support outside of the group. |
| Individual interventions | | | | | | | | |
| Delshadian (2003) UK | Prison | Female prisoner (age unknown) with two arson convictions. | SC | 2 years of Art Therapy (frequency and details of the intervention unknown) | N/A | Subjective therapist reports and observations. | Incidents of firesetting decreased. The participant developed insight into her firesetting and impulses, which she could process. | Incidents of self-harm decreased. |
| Lande (1980) USA | Behaviour therapy unit | 20-year-old White male imprisoned for two firesetting incidents in his house associated with masturbation and fire fetish (pyrolagnia). | SC | Orgasmic reconditioning (4 weekly sessions) to increase heterosexual arousal (masturbating while viewing fire images followed by female nude images and imagining heterosexual activity). Covert sensitisation (3 weekly sessions) to decrease deviant sexual arousal to fire-related stimuli (masturbating while viewing pictures of fire and listening to highly unpleasant and adverse scenes). | N/A | Monitoring heart rate and penile circumference. Subjective verbal reports of arousal in response to nude women and fire slides. Recidivism rates at 4- and 9-month follow-ups. | Sexual arousal and heart rate decreased for fire stimuli after 4 months and were maintained 9 months later. No firesetting incidents for 9 months (living with relatives). | Sexual arousal increased for women and female slides after 4 months and was maintained 9 months later. Heart rate for female slides increased after 4 months and returned to the same rate 9 months later. |
| Royer et al. (1971) USA | Inpatient ward | Male inpatient with severely disorganised schizophrenia, severe ID, and persistent fire-setting behaviour; medicated with phenothiazines. | SC | Aversion conditioning therapy with electric shocks: 9 sessions in 2 phases and 6 boosters (26 weeks). Phase 1: A series of cards with neutral and critical words (e. g., "fire" or "flame") were presented. Electric shock was delivered each time he read a critical word. | N/A | Latencies of picking up or lighting the matches and setting fire to the paper. Therapist observations. Recidivism rates. | Phase 1: No changes. Phase 2: The time of selecting and picking up the match was increased. The latencies before lighting the match, holding the match near the striker, and setting fire to the paper increased. | Degree of contact, orientation, and general verbal coherence increased after the phase 2. Side effects (marked autonomic disturbance) were reported. |

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Table 2 (continued)

| Authors, year, & country | Setting | Sample characteristics | Study design | Intervention | Control group | Outcome measures | Key findings | |
|---|---------------------------------------|---|--------------|--|---------------|--|---|---|
| | | | | | | | Fire-specific outcomes | Secondary outcomes |
| | | | | Phase 2: Patient was asked to set fire to toilet tissues with matches 20 times; patient was shocked each time the flame touched the paper, and each time he ignited the match. | | | No fire-setting incidents were reported for nearly 4 years. | |
| Winters et al. (2022) USA | Prison | 25-year-old White incarcerated male with bipolar I disorder and one arson conviction; attending other groups; medicated. | SC | Intervention for Firesetting Offenses (INFO; 8 individual sessions), including psychoeducation, motivational interviewing, CBT strategies, and relapse prevention. | N/A | Therapist observations and self-report | No formal evaluation outcomes were reported. Improvement in understanding firesetting and motives/risk factors associated with firesetting and development of a relapse prevention plan. | N/A |
| Group interventions accompanied by individual sessions | | | | | | | | |
| Annesley et al. (2017) UK | High-secure mental healthcare service | 22 female inpatients (mean age = 33, range = 21–47; 95 % were White British); were detained under the MHA; 19 (86 %) were convicted of arson/firesetting; 73 % also received DBT. | AB | Arson Treatment Group Programme (ATGP) and Arson Treatment Individual Programme (ATIP), based on CAT and CBT combined. MDT input, supervision and training were offered. Two ATGPs (closed groups) ran weekly, 2.5 h each, plus weekly/fortnightly individual sessions. 3–5 facilitators and one staff member outside the room for support. Group 1 (n = 4) delivered 2007–2008 for 61 weeks (16 months). Group 2 (n = 5) Delivered 2011–2012 for 66 weeks (18 months). ATIP1: 2 high-risk patients between 2009 and 2010 (32 sessions). ATIP2: 4 high-risk patients between 2013 and 2015 (32 sessions). | N/A | ATGP1: BAI FIRS FAFS IRI PRI ELS ATGP2: IASC SPSI-R MSEI or RSES CRI PDS Patient feedback Supervisor records | ATGP1: 4/6 (67 %) completed; 95 % attendance. Interest in fire decreased. Participant's feedback: 4.08/5. ATGP2: 5/8 (63 %) completed; 93 % attendance. Participant's feedback: 4.40/5 ATIP1: 2/4 (50 %) completed; 100 % attendance. One participant's fire interest increased, and another's decreased. Participant's feedback: 4.88/5. ATIP2: 4/5 (80 %) completed; 99 % attendance. Participant's anxiety around starting a fire slightly decreased. Participant's feedback: 4.37/5. 7 % drop out; 1/3 did not complete due to mental health deterioration or transfer to other settings. | ATGP1: Use of fantasy, personal distress, and loneliness decreased; no changes for socially desirable responding and blame attribution. ATGP2: Self-capacities, problem-solving, emotional problems, self-liking and global self-esteem improved. Impression management and self-deceptive enhancement varied. ATIP: all participants improved in 10/11 self-capacities, all emotional problems and problem-solving. ATIP1: improvements in global self-esteem, competence and lovability. ATIP2: improvements in self-esteem, self-liking, self-competence, and impression management. |

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Table 2 (continued)

| Authors, year, & country | Setting | Sample characteristics | Study design | Intervention | Control group | Outcome measures | Key findings | |
|----------------------------------|--|--|--------------|---|---------------|--|---|---|
| | | | | | | | Fire-specific outcomes | Secondary outcomes |
| Ashworth et al. (2017) UK | Medium secure ID service | Male forensic inpatient diagnosed with mild ID (FSIQ = 69) and EUPD; under the MHA; 2 charges of arson, 36 offences, and 14 convictions; medicated and attended social, psychological, and occupational therapy groups. | SC | Adapted DBT programme (<i>I Can Feel Good</i> ; Ingamells & Morrissey, 2014). 47 2 h group sessions were held off-ward weekly (3–9 participants in each session, 5 on average), facilitated by a clinical and a forensic psychologist in training. Trained nursing staff also assisted. The final 9 sessions were delivered individually in long-term segregation. | N/A | EPS-BRS CAMS-R ECQ CRI CIRCLE Staff notes after each session. Staff-reported measures completed by Named Nurse. | N/A | Little or no change in most emotional and social skills. Little improvement in cognitive and behavioural functioning (91.5 % attendance). Self-reported application of mindfulness strategies was increased but not observed by staff. Increased physical aggression, impulsiveness, and somatic concern. Overall risk maintained. Patient was transferred to another secure setting due to escalation in aggression. |
| Clare et al. (1992) UK | Specialist inpatient unit (transferred from a maximum security hospital) | 23-year-old male diagnosed with a psychopathic disorder and mild ID (FSIQ = 65); 2 arson convictions, 17 months of admission; history of firesetting and making hoax calls to the fire service and helplines (e.g., Samaritans). | SC | Treatment package based on CBT and Jackson's (1987) functional analysis (18 months). Graded exposure for anxiety of matches (3 months individually) and progressive muscle relaxation (individual and group weekly). Assertiveness, social and coping skills training (separate weekly groups, 1 h each). Fire education with fire officers. Assisted covert sensitisation for self-control of firesetting (25 individual sessions). Surgery for facial disfigurement and part-time employment. | N/A | Rating of patient's features and facial attractiveness by staff/independent assessors. Ratings of social skills, criminal behaviour, employment, relationships, well-being, and independence by 60 independent assessors. 48-month follow-up. | No evidence of firesetting, making hoax calls, or criminal offences during his admission and up to 48 months post-discharge to a community placement. | Sig. clinical improvements in coping and interpersonal skills, confidence in communicating feelings. Started a full-time job, moved into a supporting living accommodation and formed a romantic relationship. Face attractiveness: familiar staff judged his face as sig. more attractive than unfamiliar people after three surgeries. |

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Table 2 (continued)

| Authors, year, & country | Setting | Sample characteristics | Study design | Intervention | Control group | Outcome measures | Key findings | |
|---------------------------------|---|---|--------------|---|---|---|---|---|
| | | | | | | | Fire-specific outcomes | Secondary outcomes |
| Gannon et al. (2015) UK | 7 medium secure prisons (2 treatment sites and 5 TAU sites) | 99 male prisoners. FIPP group (n = 54; mean age = 34.6; 79.7 % were White European; mean formal education = 10.9 years; average self-reported adult fires = 5.3; average firesetting offences = 2.1). | NRCT | Firesetting Intervention Programme for Prisoners (FIPP) based on CBT and M-TTAF. 9 standardised CBT groups (28 weekly 2 h group sessions and weekly 1 h individual sessions) each consisted of 4–10 participants. Delivered by one psychologist and one assistant psychologist; training and monthly supervision provided. | TAU group (n = 45; mean age = 31.4; 82.2 % were White European; mean formal education = 12.1 years; average self-reported adult fires = 3.4; average firesetting offences = 1.6). | FFS FRP-Q MCAA-Part B NAS-PI NSLC UCLALS-R SRAS-SF CFSEI-GS IM of BIDR6 Assessed at: • baseline • immediately post-treatment • 3 months post-treatment | FIPP participants sig. improved self-reported problematic interest and associations with fire (FFS total; $p = 0.001$, $d_z = 0.30$), which was maintained at 3-month follow-up; were 3.45 times more likely to improve FFS score and 4.71 more likely to make at least one meaningful change in both fire-related and secondary outcomes than the TAU group (74.1 % vs 37.8 %). Higher rates of self-reported adult firesetting predicted larger improvements in FFS. Both groups sig. improved fire awareness, knowledge of strategies for managing firesetting risk, and relapse prevention strategies. | FIPP participants sig. increased self-reported ability to effectively regulate anger ($p = 0.002$, $d_z = 0.45$), internalised locus of control ($p = 0.019$, $d_z = 0.33$), attitudes towards violence ($p = 0.001$, $d_z = 0.46$), and antisocial attitudes ($p < 0.001$, $d_z = 0.51$) post-treatment and at 3 months. Both groups sig. improved self-esteem and ability to tolerate provocation; no sig. changes in emotional regulation, NAS total, social competence, loneliness, assertiveness, or MCAA entitlement. Attrition rates: 58.8 % for FIPP and 46.4 % for TAU. |
| Pearson et al. (2022) UK | Low-security (category C & D) prisons and those released in the community | 93 participants (mean age = 33.01, 89.3 % males, 96.8 % White British); an average of 5 offences; arson conviction; IQ > 70; not actively psychotic; no psychopathy; no murder convictions. | AB | Firesetters' Integrated Responsive Educational Programme (FIRE-P). Developed by a fire and rescue service for offenders. 7 sessions were delivered in groups of up to 8 participants with two fire service staff or individually. | N/A | Fire recidivism incidents versus expected rates, accounting for time available for offending pre- and post-treatment and fire-related charges. Follow-up at 2–11 years (average 6.25 years). | Actual rates (n = 3) were statistically sig. lower than the expected rates (n = 57), with a large effect size ($r = 0.80$). | N/A |
| Swaffer et al. (2001) UK | Maximum security psychiatric hospital | 34-year-old female diagnosed with BPD and convicted of arson; received DBT. | SC | Structured treatment programme over 16 months based on Jackson's (1987) model and CBT. 62 weekly 2 h mixed-gender group sessions with 2 facilitators (nurse and psychologist); 10 inpatients with varied psychiatric diagnoses and ID, a mean age of 30.3, and an average admission of 3.9 years. Monthly 1.5 h individual sessions. | N/A | FIRS FAFS CFSEI RAS BDI NAS FNES SPSI SOC WCMRS by the facilitators. | No mid-treatment outcomes. | Improvement in assertiveness skills and ability to communicate emotions. Improvement in interactions with peers. Positive engagement with treatment. |

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Table 2 (continued)

| Authors, year, & country | Setting | Sample characteristics | Study design | Intervention | Control group | Outcome measures | Key findings | |
|-------------------------------|---|--|--------------|---|--|---|--|--|
| | | | | | | | Fire-specific outcomes | Secondary outcomes |
| Tyler et al. (2018) UK | 26 low, medium, and high secure forensic psychiatric inpatient services | 92 mentally disordered inpatients under the MHA (83.7 % were White British). FIP-MO group (n = 52): 34 males, 18 females; mean age = 36.56 (21–57 years old). | NRCT | Firesetting Intervention Programme for Mentally Disordered Offenders (FIP-MO), based on CBT and M-TTAF. Semi-structured CBT group: 28 weekly 2 h same-sex group sessions (3–8 in each group) and weekly 1 h individual sessions; were delivered by two facilitators after receiving standardised training. | TAU (n = 40): 26 males, 14 females; mean age = 34 (20–69 years). | FIRS FAS IFQ STAXI-2 NSLC PDS UCLALS-R SRAS-SF CFSEI MCAA-Part B Satisfaction | Compared to the TAU group, FIP-MO participants sig. improved the total fire factor score ($p = 0.048$, $d_z = 0.40$). | Compared to TAU, FIP-MO participants sig. improved their ability to express anger ($d_z = 0.49$). FIP-MO participants had greater changes pre- and post-treatment in externalised locus of control, emotional loneliness, and antisocial attitudes than TAU. |

Note. Key per column: **Sample characteristics:** BPD: Borderline Personality Disorder; EUPD: Emotional Unstable Personality Disorder; FSIQ: Full-Scale Intelligence Quotient; IQ: Intelligence Quotient; ID: Intellectual Disability; MHA: Mental Health Act (1983); PD: Personality Disorder. **Study design:** AB: AB design; NRCT: Non-Randomised Control Trial; SC: Single Case. **Intervention:** CAT: Cognitive Analytic Therapy; CBT: Cognitive Behaviour Therapy; DBT: Dialectical Behaviour Therapy; MDT: Multidisciplinary Team; M-TTAF: Multi-Trajectory Theory of Adult Firesetting. **Control:** N/A: Not Applicable; TAU: Treatment as usual. **Outcomes measures:** BAI: Blame Attribution Inventory; BDI: Becks Depression Inventory; BDI-SF: Beck Depression Inventory – Short Form; CAMS-R: Cognitive and Affective Mindfulness Scale-Revised; CFSEI-2: Culture Free Self-esteem Inventory – 2; CFSEI-GS: Culture-Free Self-Esteem Inventory (2) – General Subscale; CIRCLE: Chart of Interpersonal Reactions in Closed Living Environments; CRI: Coping Response Inventory; ECQ: Emotional Control Questionnaire; ELS: Emotional Loneliness Scale; EPS-BRS: Emotional Problems Scale-Behaviour Report Scale; FAFS: Functional Assessment of Fire-Setting; FAS: Fire Attitude Scale; FFS: Fire Factor Scale; FIRS: Fire Interest Rating Scale; FIS: Fire Interest Scale; FNES: Fear of Negative Evaluation Scale; FRPQ-A: The adapted Fire Relapse Prevention Questionnaire; GAS: Goal Attainment Scales; IASC: Inventory of Altered Self-Capacities; IFQ: Identification with Fire Questionnaire; IM of BIDR6: Impression Management Scale (IM) of the Balanced Inventory of Desirable Responding; IRI: Interpersonal Reactivity Index; MCAA-Part B: Measure of Criminal Attitudes and Associates-Part B; MSEI: Multidimensional Self-Esteem Inventory; NAS: Novaco Anger Scale; NAS-PI: Novaco Anger Scale & Provocation Inventory; NSLC: Nowicki-Strickland Locus of Control; PDS: Paulhus Deception Scales; PRI: Personal Reaction Inventory; RAS: Rathus Assertiveness Schedule; RSES: Rosenberg Self-Esteem Scale; SOC: Stages of Change; SPSI: Social Problem-Solving Inventory; SPSI-R: Social Problem-Solving Inventory-Revised; SRAS-SF: Simple Rathus Assertiveness Schedule – Short Form; STAXI-2: The State Trait Anger Expression Inventory-2; UCLALS-Revised: Revised UCLA Loneliness Scale; WCMRS: Woods Community Meeting Ratings Scale. **Key findings:** sig.: Significant.

presented a case of a 25-year-old incarcerated man with an arson conviction. The authors described a brief individual Intervention for Firesetting Offenses (INFO) and reported that the participant's understanding of firesetting and motives/risk factors associated with firesetting were improved.

3.7.3. Cognitive analytic-oriented therapy

Annesley et al. (2017) implemented and assessed the effectiveness of a CAT-informed, combined with CBT, firesetting intervention delivered individually (Arson Treatment Individual Programme; ATIP) or in groups (Arson Treatment Group Programme; ATGP) in 22 female inpatients. Descriptive analyses showed a significant variation in the assessed outcomes, with most participants showing minor improvements in fire-related psychological factors.

3.7.4. Fire safety education

A brief structured FSE programme (Firesetters' Integrated Responsive Educational Programme; FIRE-P) was empirically evaluated in 93 firesetters from UK low-security prisons or the community (Pearson et al., 2022). At an average follow-up of 6.25 years (ranged 2–11 years), only three firesetting incidents were recorded in the local police risk management system. This was significantly lower than the expected rates ($n = 57$) that the authors predicted based on the number of firesetting incidents the participants engaged with historically, showing a large effect size ($r = 0.80$).

3.8. Primary outcomes

Twelve studies (85.7 %) reported fire-related outcomes. Of those, six studies utilised formal evaluation methods, such as a fire-specific psychometric measure (i.e., FAS, FIRS, IFQ, FAFS, FFS, or FRPQ-A), to assess fire-related factors (Annesley et al., 2017; Gannon et al., 2015; Pearson et al., 2022; Taylor et al., 2002, 2006; Tyler et al., 2018). Seven studies also considered firesetting incidents (recidivism). Overall, 13 studies (92.9 %) used observations or staff-reported measures, and 10 (71.4 %) used additional self-reported measures. Two studies reported no fire-specific outcome (Ashworth et al., 2017; Swaffer et al., 2001).

3.8.1. Fire-related factors

For individual interventions, two single-case studies provided subjective reports of the participants developing insight into firesetting (Winters et al., 2022) and reducing firesetting behaviours (Delshadian, 2003). Royer et al. (1971) reported that one participant's latencies increased for lighting the match and setting fire to the paper following a tailored aversion condition therapy. Lande (1980) also reported that the participant's sexual arousal for fire-related stimuli was decreased. For group-based interventions, participants with ID significantly reduced their problematic interests, attitudes, and associations with fire in one study (Taylor et al., 2002). However, no statistically significant differences were found among the few female participants in the same group (Taylor et al., 2006). Male prisoners who attended the FIPP showed a significant decrease in self-reported problematic interest and associations with fire up to 3 months post-treatment, compared to TAU, with a medium effect size (Gannon et al., 2015). Participants were also found to be 3.45 times more likely to improve fire-specific outcomes than TAU participants (Gannon et al., 2015). Tyler et al. (2018) reported that FIP-MO participants significantly improved the total fire factor score compared to the TAU group, with a large effect size. Annesley et al. (2017) further observed that ATGP/ATIP reduced fire interest for some participants.

3.8.2. Recidivism

Half of the studies ($n = 7$) reported recidivism and actual behavioural change. The follow-up times ranged from 3 to 132 months, with an average of 32.14 months (Clare et al., 1992; Gannon et al., 2015; Lande, 1980; Pearson et al., 2022; Rice & Chaplin, 1979; Royer et al.,

1971; Taylor et al., 2006). Five studies indicated that participants were discharged to supporting living accommodations or relatives' houses (Clare et al., 1992; Lande, 1980; Pearson et al., 2022; Rice & Chaplin, 1979; Taylor et al., 2006). Of those seven studies, only two provided formal firesetting reporting systems (Pearson et al., 2022) or regular follow-ups to monitor firesetting incidents in the community (Clare et al., 1992). Clare et al. (1992) indicated that the participant did not engage in further firesetting incidents, hoax calls to the fire services, or criminal offences up to 48 months post-discharge. Pearson et al. (2022) also found a large effect size of FIRE-P in reducing recidivism rates ($r = 0.80$) according to a police reporting system. The remaining five studies reported no evidence of the participants engaging in further firesetting incidents from 9 to 48 months post-treatment (Delshadian, 2003; Lande, 1980; Rice & Chaplin, 1979; Royer et al., 1971; Taylor et al., 2006).

3.9. Secondary outcomes

3.9.1. Emotional dysregulation and coping

Seven studies (50 %) assessed participants' anger. Significant improvements were reported for adults with ID participating in NFTP (Taylor et al., 2002) but not for the female-only sub-group (Taylor et al., 2006). Little effect on anger regulation was reported for a participant with ID following DBT-adapted (Ashworth et al., 2017). Male prisoners and mental health inpatients who participated in FIPP and FIP-MO showed improvements in their self-reported ability to regulate their anger effectively, internalised locus of control (Gannon et al., 2015), and their ability to express anger (Tyler et al., 2018) compared to TAU with medium to large effect sizes. Regardless of treatment, male prisoners' ability to tolerate provocation was also improved (Gannon et al., 2015). Finally, ATGP/ATIP showed varied and inconclusive effects (Annesley et al., 2017).

Five studies (35.7 %) assessed participants' depression. Taylor et al. (2002, 2006) found no effects of NFTP on depression scores in non-clinically depressed adults with ID. Annesley et al. (2017) reported that depression was among the highest motivators for firesetting, and emotional problems were improved, while DBT showed little observed change in emotional skills (Ashworth et al., 2017). Five studies (35.7 %) assessed participants' anxiety. ATGP/ATIP (Annesley et al., 2017) and DBT-adapted (Ashworth et al., 2017) had little effect on reducing anxiety levels. Social skills training reportedly improved participants' social skills, including anxiety (Rice & Chaplin, 1979). Swaffer et al. (2001) assessed anger, depression and fear of negative evaluation but did not report evaluation outcomes. Finally, only one single case study reported reduced self-harming behaviour following art therapy (Delshadian, 2003).

3.9.2. Empathy, social competence, and loneliness

Nine studies (64.3 %) assessed empathy, social competence, and emotional loneliness. Participants' communication, empathy, and verbal skills were significantly improved following social skills group training (Rice & Chaplin, 1979). Two firesetters also developed coping and interpersonal skills and confidence in communicating feelings following CBT (Clare et al., 1992; Swaffer et al., 2001). Adults with ID showed significant improvements in their emotional expression following the NFTP (Taylor et al., 2002), but the female-only subgroup did not improve (Taylor et al., 2006). Compared to TAU, there was no significant improvement in reported social competence, assertiveness, or loneliness for participants who completed the FIPP (Gannon et al., 2015) and the FIP-MO (Tyler et al., 2018). Participants engaged with ATGP/ATIP had a slight improvement in loneliness, social competence, and socially desirable responses (Annesley et al., 2017). DBT-adapted had little effect on interpersonal skills in one participant with ID (Ashworth et al., 2017). Three studies found no significant changes in deception or impression management (Annesley et al., 2017; Gannon et al., 2015; Tyler et al., 2018).

3.9.3. Self-esteem and self-capacities

Six studies (42.9 %) assessed self-esteem and self-capacities. NFTP showed significant improvements in self-esteem in adults with ID (Taylor et al., 2002) and minor non-statistically significant improvement for the female-only subgroup (Taylor et al., 2006). Regardless of their treatment group, male prisoners showed significant improvement in self-esteem (Gannon et al., 2015). FIP-MO also did not make a difference in mental health inpatients' self-esteem compared to TAU (Tyler et al., 2018). Participant's self-esteem, self-competence, self-liking, and most self-capacities were improved following ATGP/ATIP (Annesley et al., 2017). Swaffer et al. (2001) did not report evaluation outcomes.

3.9.4. Attitudes towards offending and antisocial behaviour

Male prisoners' attitudes towards violence and antisocial behaviour, compared to the TAU group, decreased following the FIPP with a large effect size (Gannon et al., 2015). While non-significant, FIP-MO participants showed greater improvements in antisocial attitudes than TAU participants (Tyler et al., 2018). NFTP increased goal attainment, victim issues, and understanding of risk in inpatients with IDs (Taylor et al., 2002, 2006). Individual CBT also helped reduce one participant's criminal behaviour (Clare et al., 1992). Increased physical aggression and impulsiveness were observed in one patient with mild ID participating in a DBT-adapted programme, possibly due to conflict with another peer (Ashworth et al., 2017).

3.10. Resources for therapy

Six studies reported that facilitators received training or followed structured therapist manuals (Annesley et al., 2017; Ashworth et al., 2017; Gannon et al., 2015; Taylor et al., 2002, 2006; Tyler et al., 2018). Two studies reported that clinical or peer supervision was offered (Annesley et al., 2017; Gannon et al., 2015). Nine studies reported needing 2–6 multidisciplinary team (MDT) members with at least one registered psychologist to facilitate each group session, while three studies required additional MDT support outside the sessions (Annesley et al., 2017; Ashworth et al., 2017; Clare et al., 1992). The reported length of the individual interventions ranged from 7 weeks (Lande, 1980; Pearson et al., 2022) to 104 weeks (Delshadian, 2003), with an average duration estimated at 30.83 weeks. The group-only interventions ranged from 4 weeks (Rice & Chaplin, 1979) to 68 weeks (Annesley et al., 2017), with an average duration of 28.5 weeks. Finally, combined group and individual interventions ranged from 28 weeks (Gannon et al., 2015; Tyler et al., 2018) to 73 weeks (Clare et al., 1992), with an average duration of 49 weeks (Table 2).

3.11. Retention rates

Three studies reported dropout rates ranging from 7 % to 50 % (Annesley et al., 2017; Gannon et al., 2015; Pearson et al., 2022). Commonly reported reasons were mental health deterioration, transfer to other settings, declining participation in research, or missing information. The completion rates ranged from 50 % to 100 % (average of 92.64 %) for individual interventions in ten studies and from 63 % to 100 % for group-based interventions (average of 90.80 %) in eight studies. Attendance rates for individual interventions were possible to be calculated in five studies ranging from 91.5 % to 100 % (Annesley et al., 2017; Ashworth et al., 2017; Lande, 1980; Royer et al., 1971; Winters et al., 2022) and for groups in three studies ranging from 91.5 % to 98.33 % (Annesley et al., 2017; Ashworth et al., 2017; Taylor et al., 2006).

4. Discussion

Despite the clear need for offence-specific interventions (Fritzon et al., 2013; Gannon & Pina, 2010; Tyler et al., 2019), there is a paucity of specialist interventions and evaluation studies for adult firesetters,

and overall the evidence base for psychological interventions for fire-setting in adults remains embryonic. The available evidence of adult psychological firesetting interventions comprises 14 peer-reviewed evaluation studies totalling 343 adult firesetters, primarily focused on CBT. Some studies adapted general psychological interventions to target criminogenic needs hypothesised to be associated with firesetting risk. Commonly targeted risk factors included social skills (Rice & Chaplin, 1979), sexual arousal (Lande, 1980), emotion dysregulation and poor coping strategies (Ashworth et al., 2017; Delshadian, 2003), or general fire interest (Royer et al., 1971). However, it is still unclear whether these effectively reduce firesetting risk.

4.1. Effectiveness of specialist firesetting interventions

Over the past two decades, the limited efforts to develop and evaluate specialist interventions have occurred almost entirely in the UK. These have consisted predominantly of CBT group-based interventions (Clare et al., 1992; Gannon et al., 2015; Swaffer et al., 2001; Taylor et al., 2002, 2006; Tyler et al., 2018), individual CBT (Clare et al., 1992; Winters et al., 2022), CBT and CAT combined (Annesley et al., 2017), and integrative FSE (FIRE-P; Pearson et al., 2022). All these interventions integrate CBT principles and primarily cover education on firesetting, coping strategies, problematic offence-related/antisocial attitudes, self-awareness and self-esteem, emotion management, communication and social competency, relationships, and relapse prevention. The available evidence allows us to provide little comment on which elements of the therapeutic process were most effective or even necessary to which offenders.

The current literature on evaluation studies primarily comprises single-case or small-scale studies. Two similar semi-structured CBT group-based interventions, FIPP and FIP-MO, underpinned by the M-TTAF (Gannon et al., 2012), are the most rigorous and high-quality evaluations. These have been developed and piloted with 99 male prisoners (FIPP; Gannon et al., 2015) and 92 mixed-gender mental health inpatients (FIP-MO; Tyler et al., 2018). Participants in both treatment programmes showed some improvements in fire-related outcomes (i.e., interest, attitudes, or associations with fire) and key psychological vulnerabilities (e.g., anger regulation or offence-supportive attitudes) compared to TAU with medium to large effect sizes across multiple secure mental health and prison settings (Gannon et al., 2015; Tyler et al., 2018). However, the authors did not report recidivism rates or long-term data, which are arguably of key importance in all forensic psychological interventions. It is, therefore, unclear if these effects can be reliably translated into behavioural change in the community, i.e. a quantifiable reduction in firesetting. Another study reported a large effect size of FIRE-P in reducing firesetting incidents among 93 adults in low-level prisons or released into the community (Pearson et al., 2022). However, the authors used only one police reporting system to follow up on firesetting incidents and a broad definition of recidivism, which warrants caution in the generalisability of their findings. We hope that researchers designing future studies in this area will pay close attention to the importance of long-term behavioural outcomes from such interventions.

4.2. Individual versus group interventions

Most firesetting interventions were delivered in groups, with supporting individual sessions. Adaptations were reported for participants who found groups difficult to engage with some positive outcomes (Annesley et al., 2017; Ashworth et al., 2017; Clare et al., 1992; Pearson et al., 2022). Interestingly, no studies directly compared outcomes for group and individual interventions, meaning there is little for us to remark on the extent to which individual or group approaches differ in terms of outcomes, or for which groups a particular – or a combined – approach is recommended. Group interventions are common among offenders and have several advantages for participants and staff (Davies,

2015, 2019; Hollin & Palmer, 2006; Ware et al., 2009). Comparatively, individual interventions can be tailored to the individual's treatment needs and enable a more specific exploration and effective management of their offence cycle (Davies, 2019). In reality, the lack of staffing resources or participant availability (e.g., participants might not share the same treatment needs) might not make a group viable (Gannon, 2015). Withholding treatment until sufficient participants have formed a group also raises ethical and clinical concerns (Ware et al., 2009). Therefore, a combination of individual and group interventions is often used in forensic settings. However, the evidence for the effectiveness of this combined approach for offence-specific interventions or which format is more effective is limited (Davies, 2019; Nagi & Davies, 2017).

4.3. Adverse effects

An often neglected research topic among offenders is the potential adverse effects of participating in psychological interventions (Ware et al., 2009). Annesley et al. (2017) noted that female participants found it hard to engage with single-gender groups. This narrative has also been observed for female participants in a mixed-gender group for adult firesetters, which was not included in the review (Hall, 1995). Another study observed that some female participants with ID seemed to have justified and rationalised (instead of challenged) their firesetting behaviours following a firesetting group (Taylor et al., 2006). This raises concerns about the risks associated with group interventions, such as maladaptive learning of firesetting behaviour from listening to other group members' stories or motives for firesetting or experiencing vicarious arousal and traumatising (Parry et al., 2016; Taylor et al., 2006; Ware et al., 2009). The potential for adverse effects of interventions – or for outcomes from interventions to occur in the opposite direction to that intended – is an important consideration in the context of an evaluation for sex offenders which indicated that more offenders who attended the group engaged in another sexual offence than those who did not attend the group (Mews et al., 2017). Other adverse events reported in the group-based programmes included clinically significant deterioration (i.e., escalation in aggression) resulting in seclusion or a transfer to another setting (Annesley et al., 2017; Ashworth et al., 2017; Gannon et al., 2015). Given the limited focus on investigating and reporting adverse outcomes associated with firesetting interventions, it is unclear whether group-based interventions have the possibility to harm certain participants. This raises professional and ethical concerns about implementing offence-specific interventions with a limited evaluation of outcomes.

There is growing evidence that partial completion (i.e., dropping out) or ineffective psychological interventions might cause significant adverse effects and a higher risk of reoffending (Marshall et al., 2003; Olver et al., 2011). Such adverse effects from therapy have severe implications for individuals and society (Farabee et al., 2004; Lowenkamp et al., 2006; Sambrooks & Tyler, 2019). While most studies reported high rates of completers and attendance, their small sample sizes did not allow conclusive interpretations. Gannon et al. (2015) reported an attrition rate of 58.8 % for the FIPP, which aligns with previous findings for group-based interventions for offenders (Olver et al., 2011). However, none of the existing studies has compared completers with non-completers to explore a relationship between attrition and outcome.

4.4. Challenges in adult firesetting research

A significant consideration is that all studies recruited highly selected samples residing in secure and restrictive living environments (e.g., prisons, secure mental health, or psychiatric inpatient facilities). While there is an obvious need for specialist treatment provisions for firesetters in inpatient and prison services, there are practical difficulties in measuring behavioural changes and firesetting risk in well-controlled environments (Gannon et al., 2015; Tyler et al., 2018). For instance, firesetting incidents are expected to be less frequent because of the

participants' secure living and restrictive environment, staff supervision, and limited availability and access to incendiaries or triggers. Life circumstances and maturation may also impact participants' beliefs (Blokland & Nieuwebeerta, 2005). Thus, it is unwise to conclude that firesetting interventions can effectively reduce recidivism risk if the follow-up is primarily conducted within the institution, and it is important that future research conducted within institutions is designed to include community as well as institutional follow-up.

Even when studies did follow up people released into the community (Clare et al., 1992; Pearson et al., 2022; Taylor et al., 2006), other considerations about the nature of the residence in the community are important. In these studies, most participants were discharged to supported living accommodations with varied supervision from staff or ongoing engagement with MDT interventions. This implies that participants might still have restricted or monitored access to incendiaries, making it harder for them to set a fire. Similarly, most studies considered the lack of recorded firesetting incidents from the police, staff, or relatives as an indicator of participants not engaging in firesetting behaviour. However, evidence shows an underreporting of offence-like incidents, including firesetting (Smith et al., 2014). Therefore, this method of measuring firesetting incidents is flawed. Pearson et al. (2022) also discussed the possibility that firesetting incidents might be recorded in different reporting systems or as a general offence, making obtaining and monitoring accurate data even harder. However, if future research is going to meaningfully demonstrate that psychological interventions can be effective in reducing firesetting, a far more nuanced and detailed approach to measuring subsequent behaviour, and accounting for the conditions of residence after the intervention, is required.

It is important to note that most studies were conducted in the UK with predominately White-identified participants. Only single-case or small-scale studies exist in the USA and Canada, which used varied psychosocial interventions with considerable ethical and methodological issues (Lande, 1980; Rice & Chaplin, 1979; Royer et al., 1971; Winters et al., 2022). There thus needs to be particular impetus to develop this field of research both within, but particularly beyond, the United Kingdom. As a strength, most studies detailed the core components and the resources required for their intervention, allowing for replication. International collaboration is needed to adapt and evaluate existing interventions across different countries and cultures with more ethnically diverse and representative samples.

Across the studies, participants were selected based on their arson convictions, severity of firesetting, general offences, clinical needs, sufficient access to relevant information, readiness to engage, and convenience sampling (e.g., residing in certain settings). Higher levels of self-reported firesetting incidents predicted better improvements in fire-related outcomes (Gannon et al., 2015). An implication is that those who take ownership of their firesetting incidents or have a more severe history of firesetting are more likely to benefit from the intervention (Gannon et al., 2015; Pearson et al., 2022). Thus, it is unclear whether recruitment bias may have impacted these outcomes, such as how non-completers with different needs (e.g., single or less frequent firesetting), motivations, or admitted to different settings would respond to the interventions (Winters et al., 2022).

While previous research indicated a high prevalence of firesetting behaviours among people with ID (Collins et al., 2021; Lees-Warley & Rose, 2015), only four single and small-scale studies reported adaptations for adults with ID (Ashworth et al., 2017; Clare et al., 1992; Taylor et al., 2002, 2006). Despite some reported benefits of those approaches, their small sample size and lack of validated psychometric measures for this population make it hard to generalise any findings. Hence, further adaptation and hypothesis testing within adult firesetters with ID or autism is needed, since it is reasonable to assume that such people may present with different needs and intervention approaches.

Another limitation pertaining to the study methodologies was the absence of control groups in most studies and the difficulties of

controlling for confounding sociodemographic, environmental, or clinical factors due to the purposive sampling of participants in restrictive settings. Positively, Gannon et al. (2015) and Tyler et al. (2018) used experimental controls to minimise the confounding effect of factors such as incarceration time, demographics, or firesetting history. However, the authors noted that regardless of the treatment, all participants showed some improvements in fire-related factors. It is also important to note that the wide range of assessments used in the studies may reflect the lack of knowledge or agreement about the key areas for intervention implementation for this population. Overall, it is important to note that only 343 adult firesetters participated in the evaluated studies, which reflects the difficulties of engaging this population with therapy and research.

We would observe that the findings of this review reflect methodological limitations observed in the child firesetting literature. For example, Johnston and Tyler (2022) also noted that the child firesetting literature is fraught with small and highly selected samples, underrepresentation of females, heterogeneity of studies, use of various outcome measures, weak research designs, high risk of reporting bias (predominantly parental and staff observations), and the lack of randomised control trials, long-term follow-up periods, reliable recording methods, and behavioural data.

4.5. Strengths and limitations

This systematic review provides a comprehensive synthesis and critical evaluation of all the available psychological interventions that have targeted firesetting in adults concerning their effectiveness. A key strength of the review is that it provides an overview of how the conceptualisation of adult firesetting and the treatment provision for this population has changed over time, shedding light on the methodological, ethical, and practical challenges in engaging this population with therapy and research. Therefore, it significantly contributes to the adult firesetting literature and the systematic review of Curtis et al. (2012).

Similar to the review from Curtis et al. (2012), a significant limitation of this review is that the limited large-scale and good-quality evaluation studies did not allow reliable conclusions to be drawn about the effectiveness of the firesetting interventions for adults. A meta-analysis of the quantitative evaluations also did not seem appropriate or meaningful for a number of reasons: (a) there was significant heterogeneity across several areas including the study designs (i.e., half were single-case studies and would have been entirely unsuitable for inclusion; some studies had quite varied processes and periods for follow ups; there was quite a difference also in the way in which control groups were used), populations (i.e., differences in diagnostic criteria, needs, comorbidities, or environmental influences), evaluation methods (i.e., differing reporting systems and lack of meaningful or validated measurements), reported outcomes (i.e., lack of reported effect sizes, significance levels, or comparable variables across studies) and interventions (the studies included group based treatments, individual based treatments, those based on a CBT or DBT model and those based on a specific theory of firesetting; significant differences in 'dose', differing use of and qualifications of facilitators, etc.); (b) most studies were of poor methodological quality which might have resulted in biased or misleading metanalytical results; and (c) our focus was on understanding the considerable heterogeneity and variation in these studies and the nature and quality of the evidence, and an attempt to meta-analyse the small number of suitable studies would have led to important differences between the studies and treatment effects. Larger scale research with more rigorous methodological and evaluation methods could allow for a meta-analytic synthesis of such interventions, provided the research improves sufficiently in methodological rigour and addresses some of the concerns identified in the present review.

4.6. Implications for research and practice

The current review highlights the need to develop further and evaluate specialist psychological interventions for adult firesetters. The available evidence for treatment provision for this clinical population is fraught with confounding variables and methodological limitations and has limited empirical evidence to support their effectiveness. Thus, we cannot be certain that adults facing charges for firesetting-related offences are able to access effective, safe, and evidence-based interventions across the criminal justice system (e.g., prison, probation, forensic community, or secure mental health services), which may delay their recovery and sentencing plans (Gannon & Ward, 2014; Tyler et al., 2019). Moreover, adult firesetters who are not successfully prosecuted are also disadvantaged because they might not be offered specialist interventions outside of correctional settings. Importantly, this also poses real challenges for treatment providers, legal professionals, commissioners, and policymakers who make decisions about treatment provision, care pathways, and sentencing planning for adult firesetters (Sambrooks & Tyler, 2019).

Resources and staffing commitment are also important. Most interventions were lengthy and required multiple facilitators, MDT collaboration, additional supporting individual sessions, standardised training, supervision, and committed clinical time to accommodate weekly group sessions. As a solution, some authors argued that standardised interventions could be facilitated by unregistered multidisciplinary staff (e.g., assistant or trainee psychologists) with adequate training and supervision (Davies, 2015, 2019; Hollin & Palmer, 2006). The expanded RNR model (Andrews et al., 2011) has implications here in describing how services should use resources for therapy and train or supervise staff to ensure engagement of higher risk cases, maximise treatment compliance, and address key criminogenic needs. Linked to this is a need for cost-effective comparisons between individual and group interventions while controlling for the effect of environmental or other therapeutic gains of the restrictive environments.

While some CBT group-based interventions have been associated with reduced problematic beliefs or associations with fire and key criminogenic needs, larger samples are needed to establish sufficient power to test such hypotheses. Comparisons between different psychological approaches, based on differing psychological theories, are also warranted.

Moving forward, larger randomised control trials are needed to account for confounding variables that may impact treatment effectiveness in inpatient or prison settings (e.g., medications, ward activities, length of admission/sentence, and discharge conditions) and to test the effects between participation and non-participation in such interventions. Re-evaluation of existing interventions across time is also critical to understanding their long-term impact or potential adverse effects associated with these interventions (Parry et al., 2016). Clinicians and service providers have an obligation to monitor and report any adverse effects associated with firesetting interventions to detect and minimise any potential harm to the participants and society by increasing reoffending (Andrews et al., 2011; Sambrooks & Tyler, 2019).

FIPP and FIP-MO are currently under evaluation for long-term effects across different environments, which is positive (Gannon et al., 2022; Sambrooks & Tyler, 2019). However, more international efforts are needed to generalise these findings across different cohorts of offenders and broader contexts. Ideally, prospective longitudinal multi-site studies with follow-up assessments and monitoring of behavioural data (e.g., recidivism rates, firesetting incidents, conviction data) are needed to understand the long-term effects of these interventions, especially in less restrictive environments. Such studies should employ multiple evaluation methods from different sources (e.g., self-report or staff/relatives' observations), validated fire-specific psychometric measures, clinically reliable changes, or reliable firesetting reporting systems (Falshaw et al., 2003; Gannon et al., 2022).

5. Conclusion

The specialist firesetting interventions currently available for adults are resource intensive, typically administered in a CBT-based group format, and designed for certain typologies of individuals (e.g., mental illness or inpatients). Although a few UK studies have shown some promising outcomes of CBT-oriented group-based interventions in reducing fire-related factors and key psychological factors considered to increase the risk of firesetting in prisoners and mental health inpatients, significant methodological limitations are observed across the breadth of the available. As a result, several unanswered questions remain regarding the treatment provision for adult firesetters, raising significant concerns about how the needs of this population are met or treated within the criminal justice system. While more research is needed to understand if the available firesetting interventions effectively and safely reduce the risk of firesetting, it is recognised that adults who deliberately set fires have complex needs and need more standardised and evidence-based treatment provision.

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Eleftherios Kipoulas: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Writing – original draft. **Athina Sideri:** Formal analysis, Methodology, Validation. **Bethany Driver:** Writing – review & editing. **Peter Ilmari Beazley:** Conceptualization, Investigation, Methodology, Resources, Supervision, Validation, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

Appendix A

Full search strategy

1. Intervention terms

("interven*" OR "treat*" OR "practic*" OR "program*" OR "educat*" OR "therap*" OR "strateg*" OR "psychol*" OR "manag*" OR "method*" OR "techniq*" OR "train*" OR "skill*" OR "work*" OR "prevent*" OR "group*")

2. Firesetting terms

("arson*" OR "fire set*" OR "fire-set*" OR "fireset*" OR "fire rais*" OR "fire-rais*" OR "fire start*" OR "fire-start*" OR "pyroman*")

3. Evaluation terms

("effect*" OR "effic*" OR "evaluat*" OR "outcome*" OR "recidiv*" OR "re-offend*" OR "re-offend*" OR "repeat fire*" OR "reconvict*")

4. Adult terms

("adult*" OR "people" OR "individual*" OR "offend*" OR "prison*" OR "criminal*" OR "forensic" OR "population")

Final search strategy

"1 AND 2 AND 3 AND 4" [manually filter: human]

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