Prevalence and correlates of firesetting behaviours among offending and non-offending youth

Watt, Bruce D.; Geritz, Kerry; Hasan, Tasneem; Harden, Scott; Doley, Rebekah

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Abstract

Purpose: Adolescents represent a disproportionate number of firesetters relative to their adult counterparts. There is limited understanding, however, in the differing rates of fire lighting behaviours between subgroups of youth.

Methods: Utilising the recently developed Youth Fire Behaviours and Interests Scale (YFBIS), the differences in firesetting behaviours between adolescents adjudicated as offenders and non-offenders were evaluated. The associations for firesetting behaviours with antisocial behaviours and callous-unemotional traits were examined utilising items from the Antisocial Process Screening Device and the Strengths and Difficulties Questionnaire. Participants were recruited across South-East Queensland; young offenders on community orders or in a youth detention centre (n=138), and adolescents from two private schools (n=136).

Results: The young offender sample reported significantly higher prevalence of having lit a fire (67.4%), compared to non-offending youth (37.5%). Of concern, approximately one in five participants from both samples reported having lit 10 or more previous fires. Repeat fire lighting behaviour in both samples was significantly predicted by history of antisocial behaviours, positive affect regarding fire, fire-related interests and preoccupation with fire. Callous-unemotional traits had a complex association with firesetting that was only statistically significant after accounting for fire-specific predictors. Findings from the current study are limited by the reliance on self-report measures without verification from carers or other collateral sources.

Conclusion: Interventions for preventing adolescent firesetting should include appraisal of general antisocial actions and more specific fire interest characteristics. Further investigation of the association between callous-unemotional traits and firesetting is required before recommendations are proffered.

Keywords: adolescent, firesetting, callous-unemotional traits, antisocial behaviour

Prevalence and Correlates of Firesetting Behaviours among Offending and Non-offending

Deliberate firesetting in Australia is estimated to cost $1.62 billion dollars annually (Rollings, 2008). In addition to the significant financial cost, deliberate firesetting has the potential to have impacts on the emotional, mental and physical wellbeing of victims and the community. In Queensland, 349 offenders were proceded against for arson offences in 2011-2012 and, of these, 133 were juveniles (16 years and under; Queensland Police Service, 2012). That is, while juveniles comprise 11% of the Queensland population who are at the age of criminal responsibility, they account for 38% of all arson offences. Comparably, in the United States, juvenile offenders accounted for 30% of all arson offences in 2012 (The Federal Bureau of Investigation, 2012). Outside of police records, the prevalence of adolescent firesetting is difficult to establish as the research to date has methodological constraints and statistical limitations (Slavkin, 2004). Studies that have been completed with children and adolescents suggest that firesetting behaviour is quite common.

Prevalence of Juvenile Firesetting

Distinctions in the literature have been proffered between fire or match play and firesetting behaviours. Fire or match play tends to be limited to playing with matches, a lighter or candles (Grolnick Cole, Laurenitis, & Schwartzman, 1990; Kolko, Day, Bridge, & Kazdin, 2001). In contrast firesetting pertains to the deliberate setting of fires (Lambie & Randell, 2011) that the person is not supposed to have lit (MacKay, Paglia-Boak, Henderson, Marton, & Adlaf, 2009) and involves burning some type of property (Kolko et al., 2001). Specificity of definition has not always been evident in the literature, with Del Bove, Capara, Pastorelli, and Paciello (2008) identifying adolescent firesetters based on one question “I have set fires”. Such operational definition does not distinguish youth who may have lit fires for camping purposes, for example, from youth who may have caused damage to their own or other people’s property.

In a community sample of children between 6 and 14 years, Grolnick et al. (1990) reported that 38% of young people admitted to having played with fire (N=770). In a slightly older community sample of 567 participants aged between 11 and 17 years, Del Bove et al. (2008) found that 29% reported having engaged in firesetting activities. Similarly in a large sample of 3965 students between 11 and 18 years of age, 27% reported firesetting during the past year (MacKay et al., 2009). Studies of young people in clinical settings have found elevated rates of firesetting (Kolko & Kazdin, 1989; McCardle, Lambie, & Barker-Collo, 2004). For example, in 268 children aged between 6 and 13 years, 52% and 45.8% of a patient sample had a history of matchplay and firesetting behaviours respectively, compared to 42.8% and 26.9% of the non-patient sample (Kolko et al., 2001).

Dadds and Fraser (2006) found that 2% of 1359 parents surveyed in a community study reported that their child (between 4 and 9 years) had engaged in match play. Of 2596 Australian grade 8 students (approximately 13 years-old), Martin, Bergen, Richardson, Roeger, and Allison (2004) found that 10.6% of boys and 3% of girls admitted to "setting a fire in public for fun". While these findings might suggest that the rate of firesetting amongst Australian youth is lower than other countries, it is possible that the difference in prevalence rates could be attributed to methodological issues. Surveying parents as opposed to young people themselves or only asking youth about lighting fire for *fun* may underestimate the prevalence of firesetting among youth.

Other than Australian data, research has consistently found that a significant proportion of children (both community and non-community populations) engage in firesetting behaviours. As a result, firesetting behaviours have increasingly been conceptualised as relatively normal and part of a typical developmental pathway (Gaynor, 1996; Suss, 1998). Gaynor proposed that throughout development, children pass through sequential phases, learning age-appropriate and fire-safe behaviours underpinned by an adaptive curiosity about

the world and the way in which it works. Fire-interest and match play behaviours typically decrease and cease over late childhood and adolescence, though the presence of problematic individual, family and/or social factors can result in a deviation from the typical developmental pathway whereby an interest in fires and/or deliberate firesetting behaviours persists. While there are a number of research papers describing the behaviours and motivations of young people during episodes of firesetting (e.g., Del Bove et al., 2008; Kolko & Kazdin, 1994; Walsh & Lambie, 2011), few attempts have been made to define normative and typical firesetting behaviours and activities, and how these can be distinguished from more problematic or atypical firesetting behaviours.

Risk Factors for Juvenile Firesetting

A significant proportion of the firesetting research has focused on identifying risk factors among different subgroups of children (particularly those between the ages of 6 and 13 years-old). This research, however, appears to be fragmented and spread across different age ranges, focussing on various correlates with different measures and different definitions of firesetting behaviours. Despite methodological differences, three general domains have emerged as risk factors associated with firesetting behaviours: characteristics of the child, characteristics of the caregiver or family dynamics, and the broader family climate (McCarty & McMahon, 2005). Individual characteristics associated with firesetting adolescents include being male (Kolko, 1985; Martin et al., 2004), having psychiatric diagnoses such as conduct disorder (Kolko & Kazdin, 1991a) and attention deficit hyperactivity disorder (Roe-Sepowitz & Hickle, 2011), depressive symptoms (Pollinger, Samuels, & Stadolnik, 2005), engaging in drug use and suicidal behaviour (Martin et al., 2004), lacking in social skills such as having poor social judgement, inadequacy in peer relations and poor planning (Sakheim & Osborn, 1999), and having a greater interest in fires than same aged peers (Becker, Stuewig, Herrera, & McCloskey, 2004; Lambie & Randell, 2011; MacKay, Henderson, Del Bove, Marton,

Warling, & Root, 2006). Family dynamics and broader characteristics associated with firesetting include a maladaptive family environment (Kolko & Kazdin, 1991b), history of maltreatment (Root, MacKay, Henderson, Del Bove, & Warling, 2008), and low socioeconomic status (Alder, Nunn, Northam, Lebnan, & Ross, 1994). Whether the firesetter experiences positive feelings after fire and is not scared by his/her actions may be an important determinant of subsequent progression to serial firesetting (McCardle et al., 2004). In a study of convicted adult offenders, there was no significant difference found between serial and one-time firesetters in their retrospective reported experience of playing with fire as children, but serial firesetters noted greater fire-related interest (Doley, 2009). Hence, assessment of fire interests and fire-related emotions may be important in identifying youth at risk for persistent fire lighting.

One of the strongest correlates of firesetting behaviours amongst adolescents is engaging in other antisocial behaviours. In a review of the literature, Kennedy, Vale, Khan, and McAnaney (2006) found that across four studies covert aggression significantly predicted recidivistic firesetting behaviour. Walsh, Lambie, and Stewart (2004) highlighted the robust association between engaging in firesetting behaviours and the tendency to engage in a diverse array of antisocial behaviours. Furthermore, adolescents engaging in firesetting behaviours are often more behaviourally disturbed than other antisocial adolescents. Stickle and Blechman (2002) compared non-firesetting and firesetting delinquents finding that firesetters exhibited significantly higher levels of aggression and engaged in more severe antisocial acts. Compared to other conduct disorder symptoms, firesetting has been identified as a marker for involvement in severe antisocial behaviour (Gelhorn et al., 2009).

Surprisingly, few attempts have been made to examine the contribution of personality characteristics on firesetting behaviours in adolescents, particularly given the strong links between personality characteristics and offending behaviours generally. Using the Minnesota

Multiphasic Personality Inventory-Adolescent (MMPI-A; Archer, 1992), Moore, Thompson, Pope, and Whited (1996) found firesetters had significantly higher scores on the clinical scales schizophrenia, mania and psychasthenia when compared to non-firesetting adolescents. Similarly, Del Bove et al. (2008) found community firesetters to score higher on measures of moral disengagement, irritability and hostile rumination than non-firesetters.

One personality characteristic strongly associated with general antisocial behaviours in youth is callous and unemotional traits (Scheepers, Buitelaar, & Matthys, 2011). Callous-unemotional traits (CUT) have been found to interact with antisocial behaviours, so that youth with high levels of both pose the greatest concern for persistent and severe offending behaviour (Frick et al., 2003). Despite the relevance of CUT in identifying antisocial youth at particular risk for continued offending behaviours, the association has not been empirically tested in firesetting research (Lambie & Randell, 2011). Although some studies (such as Dadds & Fraser, 2006) describe firesetters as having little empathy or concern about the impact of firesetting on others, the contribution of CUT remains unknown.

The current study extends previous literature by examining firesetting behaviours and personality characteristics among juvenile offenders and non-offending youth. For the purpose of the current study, firesetting was defined as having started a fire when the person was not supposed to, that involved lighting fire to an object. Such behaviour is contrasted with having lit fires for useful purposes, such as bonfires, lighting cigarettes or cooking, and is differentiated from playing with matches.

We hypothesised (a) that juvenile offenders would report more frequent and more problematic firesetting behaviours compared to non-offending youth. Problematic firesetting behaviours were considered to include lighting fires to household objects, lighting fires outdoors, and lighting fires that got out of control or required response from emergency services. Based on previous association between firesetting and antisocial behaviours and the

role of CUT in other offending behaviours we hypothesised (b) that self-report of antisocial behaviours and CUT would significantly predict firesetting behaviours for both juvenile offenders and community youth. In addition it was hypothesised (c) that CUT would interact with antisocial behaviours increasing the prediction of firesetting behaviours, whereby youth with highest levels of both constructs would have the greatest prevalence and frequency of firesetting behaviours. Finally we predicted (d) that specific fire-related items, such as interest in fires, and preoccupation with fires, would enhance the prediction of firesetting beyond demographic and personality characteristics.

Method

Participants

Adolescents residing in south-east Queensland, Australia, were recruited to participate in the study (N=274). Half of the participants were recruited from two non-government schools (N=136) and the remainder were adjudicated juvenile offenders (N=138). For the young offenders, 35 were recruited from a youth detention centre and 103 juveniles from three community-based juvenile justice centres. Age of the participants ranged between 12 and 19 years (*M*=15.75, *SD*=1.30), with males representing 72.3% of the sample. Among the 239 youth who were not incarcerated, 69.9% were recruited from urban locations and 30.1% from regional locations. Ethnically, 23.0% of youth identified as indigenous Australian (Aboriginal and/or Torres Strait Islander), 63.1% as Caucasian, 12.8% as other and 1.1% did not report ethnicity.

Measures

Demographic questions constructed for the current study included participant age, geographic location, sex, and ethnicity. Self-report inventories were selected/constructed to be brief and maximise the likelihood that they would be completed.

Antisocial Behaviour and Callous-Unemotional Traits. Dadds, Fraser, Frost, and Hawes (2005) combined items from parent-report versions of the Antisocial Process Screening Device (APSD; Frick & Hare, 2002) and the Strengths and Difficulties Questionnaire (Goodman, 1997) in developing a psychometrically sound measure of antisocial behaviours and CUT. Utilising factor analysis across the two scales with a sample of 1,359 children (4-9 years-old), Dadds et al. identified five factors: antisocial, anxiety, callous-unemotional, hyperactive and peer problems. Behaviours assessed by the antisocial behaviours scale include physical aggression, stealing, deception and rule violation, while the CUT scale assesses limited empathy, lack of guilt, being unkind and unhelpful. The refined antisocial behaviours (12 items) and CUT (nine items) scales were found to have acceptable internal consistency, high stability over one year, and significantly predicted subsequent antisocial acts. Using a small sample of maltreated adolescents, Leist and Dadds tested a youth self-report version of the Dadds et al. measure for antisocial behaviours and CUT. Supporting the validity of the youth version, the CUT and antisocial behaviours scales predicted deficits in emotional recognition (Leist & Dadds, 2009). The Leist and Dadds youth report version was used in the current study finding acceptable internal consistencies for the antisocial behaviours scale $\alpha = .76$ and $\alpha = .75$, and the CUT scale $\alpha = .74$ and $\alpha = .84$, for the young offender and community samples, respectively.

Firesetting Behaviours. The Youth Fire Behaviours and Interests Scale (YFBIS) was developed for the current study comprising 13 self-report items appraising previous involvement in firesetting (See Appendix A). Item construction was based on a previous

literature review on juvenile firesetting conducted by Geritz and Tepper (2008). Firesetting behaviour was defined as non-sanctioned lighting of fires, as opposed to helpful behaviours such as bonfires, lighting cigarettes or cooking. The initial two items pertained to the frequency of playing with matches and starting a fire. Five questions inquired about the context of starting fires; with friends, object set fire to, location, reason, and consequences of fire lighting. Affect, interest and preoccupation (frequency of thoughts about fire) were appraised by four items. One item requested the initial age of playing with matches/fire, and the final question asked the likelihood of lighting fires in the future. Pilot testing of the YFBIS was completed with a youth mental health consumer group (n=6) whom provided feedback regarding wording of items and the size of boxes for participants to respond. Internal consistency for the combined 13 items was good to excellent for the youth offender α =.79 and community α =.90 samples.

Procedure

Teachers from non-government schools distributed explanatory statements and parental consent forms to students. Students who returned consent forms were provided with the questionnaires as well as instruction for completion. Juvenile justice participants were recruited by research students. The research students explained the study to youth and their parents, obtaining consent from both parties. All procedures were completed in accordance with Bond University and Queensland Health research ethics committee approvals.

Analytic Plan

Data were initially examined regarding the prevalence of firesetting behaviours and levels of antisocial behaviours and CUT between juvenile offenders and non-offenders. Chi-square analyses were conducted to determine the statistical significance for firesetting behaviours between the two groups with Cramer's *V* and odds ratio (OR) reported for effect sizes. Analyses for between group differences on antisocial behaviours and CUT were

examined via t-tests with Cohen's d for effect sizes. Due to the anticipated difference between juvenile offenders and non-offenders for firesetting behaviours, regression analyses were conducted separately for the two samples. Multinomial logistic regression analyses were conducted evaluating the predictors of one to two and three or more fires, with participants who reported lighting no fires as the reference group. Demographics (age, sex and ethnicity) and personality characteristics (antisocial behaviours, CUT and their interaction) were entered at step one, and fire-related variables (affect, interest, interest compared to friends, and preoccupation) were entered at step two. To further evaluate the interaction between antisocial behaviour by CUT on firesetting, a tertial split was generated for antisocial behaviours. The regression slopes were then evaluated for CUT predicting firesetting within low, medium and high levels of antisocial behaviour. Logistic regression was conducted evaluating the prediction of multiple firesetting (three or more fires) with one to two fires set as the reference group. Having lit fires with friends or alone, reason for firelighting, and age of first fire lit were added to the fire-related variables for the prediction of repeat firesetting.

Results

Rates of firesetting behaviour are presented in Table 1. Playing with matches and starting a fire was prevalent in both samples. Juveniles offenders were more likely to report playing with matches, χ^2 (4, N=274) = 31.67, $p < .001$ Cramer's $V = .34$, and having started a fire, χ^2 (4, N=274) = 29.32, $p < .001$ $V = .33$, compared to community youth, which were moderate effects. The odds ratio for a juvenile offender having started a fire were 3.44 times higher compared to community youth (95% CI 2.10 to 5.66). The most frequent forms of firelighting were setting fire to outside objects or plants (38.2%), setting fire to a small item (36.1%), using a lighter with a spraycan (11.1%) and setting fire to larger household items (6.9%). Among the juveniles who lit fires, the most frequently endorsed reason was for

fun/boredom (67.4%), then curiosity (13.2%), and because friends were lighting fires (9.7%). Release tension/revenge was rarely cited as a reason for fire lighting (2.8%).

While the majority of fires were considered to have not got out of control and ceased without intervention (52.8%), a substantial proportion were reported to have resulted in a response from emergency services (17.4%) and a further 8.3% of juveniles reported fires that got out of control. Compared to community youth, juvenile offenders' were significantly more likely to set fire to outside objects or plants, 10.9 vs 35.5%, χ^2 (4, N=274) = 42.09, $p <$ .001, V = .39, and their fires were more likely to result in a response from emergency services, 0 vs 18.1%, χ^2 (4, N=144) = 46.69, $p <$ .001, V = .41. Beyond fires requiring an emergency response, 8.0% of juvenile offenders and 2.2% of community youth reported having lit fires that got out of control. Relative to community youth, the odds of starting a fire that got out of control and/or resulted in an emergency response were 15.65 times higher for juvenile offenders (95% CI 4.69 to 52.25). Of note, two participants (one juvenile offender, one community) reported having fires that got out of control started by playing with matches only.

Differences in self-reported involvement in antisocial activities and CUT between juvenile offenders and community youth were evaluated. Consistent with their involvement in the justice system juvenile offenders reported significantly higher levels of antisocial behaviour (M = 7.46, SD = 3.93) compared to community youth (M = 4.95, SD = 4.21), t (272) = 5.09, p <.001, d = 0.62. Juvenile offenders also reported significantly higher levels of CUT (M = 5.77, SD = 3.23) compared to the non-offending sample (M = 4.01, SD = 2.99), t (272) = 4.66, p <.001, d = 0.56.

Results for predicting having lit 1-2 fires and three or more fires, with no firesetting as the reference group, are presented in Tables 2 and 3. Demographics of age, sex and ethnicity did not significantly predict juveniles who lit fires. Antisocial behaviours were found to

predict fire lighting behaviours across both samples. Youth who reported involvement in more antisocial behaviours were more likely to report having lit one to two fires (offender sample only, *B* = 0.17 *SE* = 0.07 Wald = 5.30, *p* = .021) and three or more fires, compared to less antisocial youth (community youth *B* = 0.14 *SE* = 0.06 Wald = 5.24, *p* = .022, offender sample *B* = 0.20 *SE* = 0.07 Wald = 8.00, *p* = .005). CUT did not significantly predict fire lighting at step one, nor did the antisocial by CUT interaction.

As can be seen in Tables 2 and 3 the addition of fire-related predictors enhanced the prediction of having lit fires for both samples. Fire-related affect was the only predictor that was significant for both the community and juvenile offender samples, predicting having lit three or more fires, compared to no history of fire lighting (community *B* = 1.04 *SE* = 0.38 Wald = 7.71, *p* = .005, offender *B* = 0.72 *SE* = 0.29 Wald = 6.20, *p* = .013). Juveniles who reported greater involvement in firelighting reported more positive emotional reactions in response to fire, compared to juveniles who had lit no fires. For the community sample, reporting greater interest in fire compared to friends predicted having lit one to two and three or more fires (*B* = 1.08 *SE* = 0.54 Wald = 4.03, *p* = .045, *B* = 1.21 *SE* = 0.56 Wald = 4.60, *p* = .032 respectively).

Intriguingly, CUT only emerged as a significant predictor of firesetting after the introduction of the fire-related variables (*B* = 0.39 *SE* = 0.17 Wald = 5.38, *p* = .02). For the community group, each unit increase in CUT was associated with a 1.46 increase in odds of having lit three or more fires after fire-related variables were entered into the equation. For the juvenile offender sample, a significant interaction between CUT and antisocial behaviour emerged in step two (*B* = -0.58 *SE* = 0.28 Wald = 4.20, *p* = .04). Inconsistent with the hypothesis, for each unit increase on the interaction term of antisocial behaviours and CUT, the odds of having lit three or more fires was 0.44 times less. The interaction is plotted in Figure 1. As can be seen, CUT had limited effect on firesetting behaviours for juvenile

offenders reporting medium and high levels of antisocial behaviour. For juvenile offenders with low rates of antisocial behaviour, elevated levels of CUT was associated with greater involvement in firesetting behaviours, compared to juveniles reporting less CUT.

Predictors of repeat firesetting behaviour (3+ fires), with one to two fires as the reference group are presented in Table 4. Demographics, antisocial behaviour and CUTs did not significantly predict repeat firesetting for either the community or juvenile offender sample. The interaction between antisocial behaviour and CUT was not statistically significant. Increment in the overall model variance was evident with the addition of the fire-related predictors. Repeat firesetting was predicted by emotional reaction to fire for the community group (B = 2.03 SE = 1.02 Wald = 4.00, p = .045), and self-reported interest in relation to peers and preoccupation with thoughts of fire for the juvenile offender sample (B = 0.86 SE = 0.30 Wald = 5.42, p = .02, B = 0.79 SE = 0.40 Wald = 3.87, p = .049, respectively). Juveniles who lit multiple fires reported more positive affect, greater interest in fires, and thinking more often about fire, compared to juveniles who lit one to two fires.

Discussion

The current study investigated the prevalence and characteristics of firesetting behaviours among offending and non-offending youth. As expected, juvenile offenders were significantly more likely to engage in firesetting and reported lighting more fires compared to community youth. Relative to non-offending youth, juvenile offenders were more likely to set fire to outdoor plants, and their fires were more likely to get out of control or result in a response from emergency services. As hypothesised, youth who reported greater involvement in antisocial behaviour were more likely to engage in firesetting behaviours than youth who reported less involvement across both the offender and non-offender samples. The contribution of antisocial behaviour, however, was less relevant in the prediction of firesetting behaviours once fire-specific variables were taken into consideration; fire affect

and fire interest. The hypothesised contribution of CUT to the prediction of firesetting was only partially supported, with CUT predicting firesetting behaviours after fire-specific variables were entered into the regression equations.

Playing with matches and starting a fire was common among both the offending and non-offending youth in our sample. Surprisingly, one in five participants from both groups reported having lit 10 or more fires. The prevalence of firesetting behaviours found in our study is consistent with past studies, which have demonstrated that firesetting behaviour is not uncommon amongst young people and may be somewhat normative behaviour (Del Bove et al., 2008). Our findings suggest that the relative prevalence of firesetting behaviour and the reported number of instances of repetitive firesetting behaviour in young people with and without histories of antisocial behaviour is higher than previously determined with Australian samples (Martin et al., 2004). Among community youth, fires typically did not get out of control, but one quarter of juvenile offenders lit fires that got out of control and/or prompted an emergency response. Despite the relatively low rate of out of control fires among community youth, four community youth reported they had lit fires that got out of control, including one who reported only having played with matches. This finding highlights that seemingly innocuous fire-related activities have the potential to cause significant damage.

Fire-specific variables enhanced the prediction of firesetting behaviour, beyond that accounted for by antisocial behaviour. Further, fire-specific variables were the only characteristics that differentiated youth who lit one or two fires, from youth who lit three or more fires. More positive affect regarding fire, greater interest in fire and persistent thinking of fire significantly predicted repeat firelighting. The result that firesetting behaviours were associated with positive affective states could be related to previous findings that have demonstrated elevated rates of emotional disorders in young people with histories of firesetting (Becker et al., 2004; Kosky & Silburn, 1994). Given that young people with

firesetting behaviours are more likely to have emotional difficulties, lighting of fires may pose a functional strategy in regulating dysthymic or other negative affect. The finding that firesetters held more positive views and greater interest regarding fires, compared to nonfiresetters, is consistent with recent work by Ó Ciardha and Gannon (2012) highlighting the role of implicit theories in arson offending. Continuing to develop and refine approaches to appraise cognitions and affect toward fire is a key area for ongoing research.

Persistent firesetting was associated with antisocial behaviour, which is consistent with previous studies with juvenile and adult community samples (Ducat, McEwan, & Ogloff, 2013; Kennedy et al., 2006). Curiously, CUT were initially unrelated to firesetting behaviours. Callous-unemotional traits contributed only after fire-specific variables were entered into the regression equations. Specifically for community youth, higher levels of CUT in combination with fire-related variables were associated with having lit three or more fires compared to youth with lower levels of CUT. This is consistent with CUT playing a key role in more severe antisocial behaviours (Frick et al., 2003; Scheepers et al., 2011). The contribution of CUT among offending youth for firesetting behaviours was more complex. Callous-unemotional traits were not related to firesetting behaviours among youth reporting medium and higher levels of antisocial behaviours. Among adjudicated offenders who reported lower levels of antisocial behaviour, however, higher levels of CUT were associated with more frequent firesetting.

A current multi-factorial explanation of deliberate firesetting is the Multi-Trajectory Theory of Adult Firesetting (M-TTAF: Gannon, ÓCiardha, Doley, & Alleyne, 2012). Here deliberate firesetters are categorised on four key issues associated with firesetting: inappropriate fire scripts/interest, offense supportive cognition, self/emotional regulation issues, and communication problems. Five trajectories to firesetting are hypothesised, including: antisocial cognition, grievance, fire interest, emotionally expressive/need for

recognition, and multi-faceted. It is possible for juvenile offenders with lower levels of antisocial behaviours and higher CUT, firesetting may represent a combination of factors more relevant to grievance or emotional expression, as opposed to general antisociality. Alternatively, the lower level of CUT among juvenile offenders who reported low antisocial behaviour and no firesetting, may reflect impression management with reluctance to report deviant characteristics. Our results suggest that due to the complexity of the association between CUT with firesetting behaviour, further research could assist to clarify the relevance of CUT for youth with low levels of antisocial behaviour.

The findings from the current study are limited by the reliance on self-report measures without verification from other collateral sources and could misrepresent the prevalence and nature of firesetting behaviour in youth. The accuracy of the findings is only ensured by the extent to which the samples correctly understood the questions. Whilst the authors reviewed understanding of the questions with a small pilot study, it remains possible that some youth may not have understood the questions. The generalisability of the results to other Australian youth is unclear, as it is not known whether the current sample is representative of the larger adolescent population. It is also unclear whether our sample was biased, as the recruitment rate could not be determined. Additionally, information pertaining to the young person's developmental history, family background, socio-economic status, psychiatric symptoms and broader social context was not obtained. The potential influence of these variables on firesetting behaviours could not be ascertained.

The validity of the YFBIS with regard to predicting future risk of firesetting behaviour is yet to be established. Convergence with previously established measures of fire interests and involvement in firesetting behaviours has not been evaluated (e.g., the Fire Setting and Fire Proclivity Scales; Gannon & Barrowcliffe, 2012). Longitudinal studies incorporating recidivism data would be beneficial to establish the predictive validity of the YFBIS tool to

inform early detection and intervention. The combined APSD and SDQ screening tool has been shown to have adequate psychometric integrity for use with children aged between four and twelve years. Preliminary data supports the instruments use with adolescents (Leist and Dadds, 2009), but further evaluation of the Dadds et al. (2005) procedure with adolescent samples is necessary.

In sum, the current study has demonstrated that firesetting behaviours are relatively prevalent among Australian adolescents, particularly those with histories of antisocial behaviours. Our study supports the utility of early detection and implementing treatment interventions that address the risk factors for general antisocial behaviour and more specific factors that are unique to risk of firesetting, such as fire related interest and emotions, and history of firesetting behaviours. Further research regarding the role of CUT is needed before any clear recommendation for assessment of firesetting.

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Table 1

Frequency of Firelighting Behaviour

Sample	None	1-2	3-5	5-10	10+
		Played with matches			
Community	49 (36.0%)	18 (13.2%)	14 (10.3%)	8 (5.9%)	47 (34.6%)
Juvenile Offenders	12 (8.7%)	17 (12.3%)	18 (13.0%)	15 (10.9%)	76 (55.1%)
		Started a fire			
Community	85 (62.5%)	15 (11.0%)	8 (5.9%)	3 (2.2%)	25 (18.4%)
Juvenile Offenders	45 (32.6%)	34 (24.6%)	12 (8.7%)	15 (10.9%)	32 (23.2%)

Table 2

Logistic Regressions Predicting 1-2 and 3+ Fires among Community Youth with no Firesetting as Reference Group

	Step 1				Step 2			
Predictor	1-2 Exp (B)	1-2 95% CI	3+ Exp (B)	3+ 95% CI	1-2 Exp (B)	1-2 95% CI	3+ Exp (B)	3+ 95% CI
Age	1.19	0.74-1.19	1.46	0.95-2.24	1.13	0.65-1.96	1.83	0.87-3.85
Sex	2.70	0.51-14.38	3.74	0.95-14.80	3.99	0.66-24.23	5.96	0.88-40.12
Ethnicity ATSI	0.41	0.04-4.21	0.19	0.02-1.87	0.40	0.03-5.18	0.12	0.01-4.29
Ethnicity Other	0.96	0.21-4.50	1.12	0.36-3.52	0.99	0.20-4.98	1.82	0.39-8.42
Antisocial Behaviour	1.01	0.58-1.19	1.16*	1.02-1.31	0.97	0.80-1.18	1.02	0.84-1.23
Callous-Unemotional	1.15	0.91-1.46	1.11	0.92-1.31	1.25	0.94-1.66	1.47*	1.06-2.04
ANT x CUT	0.95	0.48-1.91	1.06	0.62-1.80	1.10	0.49-2.51	1.12	0.46-2.70
Fire Affect					0.99	0.48-2.08	2.84**	1.36-5.95
Fire Interest					1.35	0.51-3.60	1.61	0.63-4.13
Fire Interest compared to others					2.94*	1.03-8.44	3.34*	1.11-10.06
Preoccupation					0.59	0.20-1.75	0.55	0.22-1.40
Model Pseudo R^2	.25 - .30		.25 - .30		.54 - .64		.54 - .64	

* p<.05, ** p<.01, *** p<.001. Reference group Caucasian. ATSI = Aboriginal and/or Torres-Strait Islander. ANT = Antisocial behaviours. CUT = Callous-unemotional traits.

Table 3

Logistic Regressions Predicting 1-2 and 3+ Fires among Juvenile Offenders with no Firesetting as Reference Group

	Step 1				Step 2			
Predictor	1-2 Exp (B)	1-2 95% CI	3+ Exp (B)	3+ 95% CI	1-2 Exp (B)	1-2 95% CI	3+ Exp (B)	3+ 95% CI
Age	1.03	0.68-1.57	0.97	0.66-1.42	1.07	0.70-1.63	0.87	0.56-1.34
Sex	0.98	0.35-2.79	1.58	0.57-4.37	1.07	0.35-3.25	2.36	0.74-7.56
Ethnicity ATSI	1.35	0.44-4.15	2.65	0.98-7.16	1.29	0.40-4.16	2.90	0.95-8.86
Ethnicity Other	0.67	0.16-2.80	0.32	0.07-1.54	0.56	0.12-2.67	0.51	0.10-2.76
Antisocial Behaviour	1.18*	1.03-1.37	1.22**	1.06-1.39	1.19*	1.02-.1.39	1.11	0.96-1.30
Callous-Unemotional	1.03	0.88-1.20	1.09	0.94-1.26	1.01	0.85-1.19	1.05	0.90-1.24
ANT x CUT	0.69	0.41-1.17	0.65	0.40-1.05	0.74	0.43-1.29	0.56*	0.32-0.98
Fire Affect					1.60	0.91-2.79	2.06*	1.17-3.65
Fire Interest					1.49	0.78-2.84	1.36	0.76-2.44
Fire Interest compared to others					0.84	0.42-1.68	1.58	0.84-2.98
Preoccupation					0.54	0.24-1.23	1.04	0.52-2.08
Model Pseudo R^2	.18 - .21		.18 - .21		.38 - .42		38 - .42	

* p<.05, ** p<.01, *** p<.001. Reference group Caucasian. ATSI = Aboriginal and/or Torres-Strait Islander. ANT = Antisocial behaviours. CUT = Callous-unemotional traits.

Table 4

Logistic Regressions Predicting Repeat Firesetting with 1-2 Fires as Reference Group

	Community Youth				Juvenile Offenders			
	Step 1		Step 2		Step 1		Step 2	
Predictor	Exp (B)	95% CI	Exp (B)	95% CI	Exp (B)	95% CI	Exp (B)	95% CI
Age	1.41	0.65-3.09	1.82	0.50-6.57	0.90	0.60-1.36	0.90	0.53-1.55
Sex	1.51	0.18-12.53	1.46	0.46-46.39	1.59	0.51-4.99	1.84	0.47-7.20
Ethnicity ATSI	0.22	0.10-4.48	0.07	0.00-11.07	2.23	0.83-6.02	3.42	1.00-11.72
Ethnicity Other	1.23	0.24-6.30	1.52	0.14-15.95	0.55	0.11-2.85	2.27	0.32
Antisocial Behaviour	1.16	0.96-1.38	1.06	0.76-1.49	1.04	0.90-1.20	0.91	0.76-1.10
Callous-Unemotional	0.94	0.70-1.24	1.06	0.60-1.87	0.92	1.24	1.10	0.92-1.32
ANT x CUT			1.29	0.25-6.72			0.57	0.29-1.13
Lit fire alone			1.14	0.32-4.08			0.64	0.38-1.09
Fire reason			1.02	0.29-3.62			1.23	0.70-2.15
Fire Affect			7.71*	1.03-57.70			1.52	0.82-2.83
Fire Interest			1.15	0.19-7.11			0.81	0.44-1.47
Fire Interest compared to others			1.72	0.30-9.87			2.37*	1.15-4.89
Preoccupation			0.98	0.25-3.74			2.20*	1.00-4.89
Age first fire			0.98	0.71-1.36			0.95	0.80-1.14
Model Pseudo R^2	.10-.15		.38-.55		.07-.10		.29-.40	

* p<.05, ** p<.01, ***p<.001. Reference group Caucasian. ATSI = Aboriginal and/or Torres-Strait Islander. ANT = Antisocial behaviours. CUT = Callous-unemotional traits.

Appendix A

Youth Fire Behaviours and Interests Scale (YFBIS)

Please tick the appropriate boxes that best describes your experience.

Please note that for the purpose of this questionnaire, helpful behaviours associated with fire, such as bonfire, lighting smokes or cooking, are excluded.

Behaviours indicated here, refers to those that are done when you are not supposed to, for example, starting a fire when you are not supposed to.

History of fire-related activities

1. Have you ever

a) played with matches? (Please tick one) ☐ Yes ☐ No

If yes, how many times have you played with matches (without actually setting fire to anything)? (Please tick one)

☐ 1 or 2 ☐ Between 3 and 5 ☐ Between 5 and 10 ☐ More than 10

b) started a fire? (Please tick one) ☐ Yes ☐ No

If yes, how many fires have you started? (Please tick one)

☐ 1 or 2 ☐ Between 3 and 5 ☐ Between 5 and 10 ☐ More than 10

*If you have answered No to ALL of these questions, please skip to the last page of this pack.

2. Do you start fires with your friends?

☐ No, I'm usually by myself ☐ Sometimes ☐ Yes, always with my friends

Most current fire-related activity

3. Please tick the most relevant description of what happened the last time you started a fire

☐ Watched the flame on the match / lighter
☐ Set fire to a small item (e.g. piece of paper)
☐ Used a lighter and a spray-can to make a flame
☐ Set fire to a larger household item (e.g. tissue box)
☐ Set fire to an outside object (e.g. public bin)
☐ Set fire to plants (e.g. trees, bushes, grass etc)
☐ Others:_____

4. Where did this take place? (Please tick one)

☐ Indoors ☐ Outdoors

5. Why did you start the fire / play with matches?

☐ For fun
☐ Curiosity – I wanted to see what would happen
☐ Boredom
☐ Because my friends were doing it
☐ Release tension
☐ Get back at someone
☐ Other: _____

6. What were the consequences of starting the fire? (More than one can be ticked)

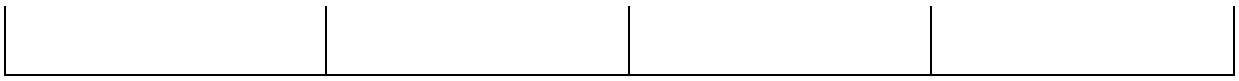
☐ It got out of control, others had to put it out
☐ It got out of control, I put it out
☐ It didn't get out of control, I put it out
☐ It didn't get out of control, others put it out
☐ The flame just died down
☐ The thing I set fire to was destroyed
☐ The police became involved
☐ I don't know, I left before it was out
☐ The fire brigade was called out
☐ I got into trouble
☐ No-one found out about the fire

Rating on fire-related activities

7. Please rate how you generally feel after starting a fire / playing with fire? (Please tick)

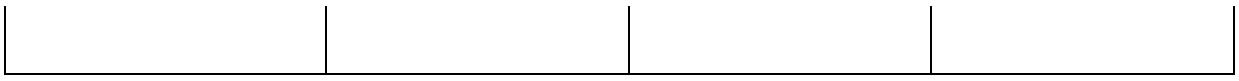
Guilty/Bad — On the fence/Neutral — Glad

8. How would you rate your interest in fires?



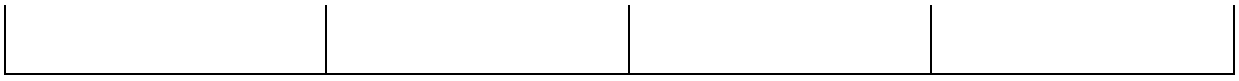
Not very — Somewhat Interested — Very Interested

9. In comparison to others your age, how interested in fires are you?



Much less — About the same — Much

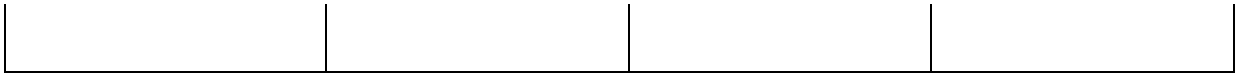
10. How often do you think about fires?



Never — Sometimes — All the time

11. How old were you when you first played with matches / start your first fire? _____ years old

12. How likely is it that you will start a fire or play with matches in the future?



Not at all likely — Maybe — Most Likely