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Academic predictors and characteristics of self-reported juvenile firesetting

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Abstract

The main purpose of this study was to address gaps in existing research by examining the relationship between academic performance and attention problems with juvenile firesetting. Two datasets from the Achenbach System for Empirically Based Assessment (ASEBA) were used. The Factor Analysis Dataset (N = 975) was utilized and results indicated that adolescents who report lower academic performance are more likely to set fires. Additionally, adolescents who report a poor attitude toward school are even more likely to set fires. Logistic regressions were run to determine if attention problems predicted firesetting and the findings indicated that attention problems are predictive of self-reported firesetting. The National Survey Dataset (N = 1,158) was analyzed to determine the prevalence of firesetting in a normative sample and also examine whether these children reported higher levels of internalizing and externalizing behavior problems. It was found that 4.5% of adolescents in the generalized sample reported firesetting. The results of t-tests indicate that firesetters reported more internalizing, externalizing and total problems than their non-firesetting peers. In this normative sample, firesetters were found to have lower academic performance and more attention problems. Limitations include the low overall number of firesetters in each dataset (Factor Analysis n = 123 and National Survey n = 53) and the inclusion of children who had been referred for services in the Factor Analysis Dataset. Future research may include exploring other characteristics of firesetters from the data available and also utilizing this data to assist with intervention and assessment of firesetting behavior.

Keywords: Firesetting, firesetter, academic performance, juvenile, attention deficit, behavior, adolescence, public health

Introduction

Rural and urban residents accustomed to seeing fire engines racing with sirens wailing and lights flashing are unaware of the problem of juvenile set fires. In 2001, the United States Fire Administration published...
findings indicating that an average of 3,650 children aged 14 years and younger were injured or killed in fires each year. A previous study by the National Fire Protection Association reported that one-third of all children who died in fires had set the fire that killed them (1). Based on these statistics, it can then be estimated that over 1,200 children each year are killing themselves through inappropriate use of fire. In comparison, the Children’s Defense Fund reported in 2009 that 938 children were killed by firearms accidentally or by suicide (2). Unfortunately, firesetting does not receive the same media attention as gun violence and deaths. Additionally, the Office of Justice Programs reports that in 2006, 49% of the individuals arrested for arson were under the age of 18 years. Juveniles are arrested for arson more than any other crime (3). If juveniles accounted for nearly 50% of the murder arrests and children playing with guns were the cause of over 1,200 injuries or fatalities, significant resources would likely be devoted to solve the problem.

Firesetting, pyromania and arson are topics that have existed in the literature since Freud explained firesetting through his psychoanalytic model. Helen Yarnell’s studies during the 1940s and 1950s were the first however to focus on the behavior of youth firesetting. Her study in 1940 found that over 70% of adult incarcerated arsonists and institutionalized pyromaniacs had firesetting histories beginning in childhood. She also introduced the concept of the ego triad: firesetting, enuresis, and cruelty to animals as predictors of violence (4). The psychoanalytic view of firesetting continued to pervade the juvenile firesetting research through the 1970’s. Beginning in the late 1970s and early 1980s, a shift occurred in the study of juvenile firesetting and also in the number of studies being conducted on the topic. Researchers like Fineman (5,6) and Kolko and Kazdin (7) began to analyze juvenile firesetting from multiple perspectives of a child’s life. The social learning and dynamic-behavioral models developed by these researchers gave clinicians a more thorough framework for understanding children who set fires and assessment tools to use in diagnosis and treatment planning. Even with the increase in interest on the topic there is still relatively little research on the problem compared to other childhood and adolescent disorders and behaviors. Gaps in the literature remain. Most of the research has focused on individual, environmental, and family characteristics of children who set fires, with little attention paid to academic and attentional variables. The existing knowledge of predictors and characteristics of juvenile firesetters is based predominantly on studies conducted with inpatient, outpatient and clinical samples.

The following review of the literature summarizes the known predictors and characteristics of juvenile firesetters and provides a brief overview of the social-learning and dynamic-behavioral models of firesetting. A discussion of gaps in the research highlighted the need for this study.

Review of literature

The characteristics reported in the literature to be associated with firesetting span all dimensions of a child’s life and include demographics, behavioral and psychological correlates, family composition, and the child’s environment.

Demographic characteristics

Demographic information about children and adolescents who set fires is frequently reported in the research with findings that are common across studies. Age and gender are consistently found to be significant predictors of firesetting behavior with boys of all ages more likely to set fires than their female counterparts.

Male gender is highly associated with firesetting. Across studies, firesetting is more prevalent in boys than girls with rates as high as 69-91% in some samples (8-14). A study of 18-year-old males and females found that 70% of the males reported playing with fire in childhood and over half reported they played with fireworks. In comparison only 44% of the females reported firesetting or fire play (15). Boys are also more likely to set multiple fires (16).

A child’s age has been shown to be associated with the type of firesetting behavior exhibited and fire play has been found to correlate with developmental age ranges as well. Interest in fire typically is exhibited in children three to five-years-of-age. Firesetting at this age may not be cause for panic as it
can be part of a child’s normal curiosity (17). Clinical studies of juvenile firesetters confirm that many children had set their first fire, also known as their index fire, when they were between six and eight-years-old (18,19) and the average age of many firesetters involved in fire education programs, residential treatment, or psychiatric hospitals is nine-years-old (9,11,20). According to Showers and Pickrell (16), the “youngest group of firesetters ages 4 to 8 was significantly more likely to set fires with financial cost of $500.00 or higher” (p. 496). Other studies also indicate a high percentage of children identified as firesetters are below 12-years-old with a smaller percentage of children falling into the older adolescent age range (16). Older age is associated with a child being more likely to seek out ignition materials and also re-offend (11, p. 119). Unfortunately, data are limited on children over 12-years-of-age who have set fires. Many jurisdictions set 12-years-of-age as the cut-off for charging children with arson. At this age, children can be remanded to court and enter the juvenile justice system versus the mental health or community services systems.

Behavioral and psychological characteristics

Children displaying fire play and firesetting behavior also exhibit a wide variety of other behavioral and psychological problems. Even when comparing firesetter and non-firesetter groups within inpatient, mental health, and hospital settings differences have been identified. A relationship has been found between conduct problems, delinquency and Attention Deficit/Hyperactivity (ADHD) symptoms and firesetting.

Conduct disorder and other externalizing behaviors, such as aggression and delinquency; have been shown in numerous studies to correlate with firesetting (14,20-27). Several researchers in the 1980s investigated the relationship between conduct disorder and firesetting. Compared to gender-matched controls and control groups, a larger percentage, ranging from 60 to 64.5%, of juvenile firesetters were diagnosed with Conduct Disorder than their peers (16,21). In one study (N = 204), 76.9% of children in a psychiatric outpatient center with a diagnosis of Conduct Disorder exhibited firesetting behavior (21). Several researchers (14, 18-20) studied children identified on a continuum of firesetting from severe to no-firesetting at all. All of these studies found that a diagnosis of conduct disorder was correlated with higher levels of firesetting behavior. There is some argument that firesetting is a symptom of conduct disorder and therefore the relationship is inherent and not correlational; however, there is no denying that firesetting behavior is a conduct problem and a relationship exists between the behavior and the diagnosis.

Children who set fires are also more likely to exhibit problematic and antisocial behaviors such as aggression, delinquency, stealing, and truancy. Within inpatient and hospitalized samples, firesetters and children who played with fire were distinguished by higher scores on aggression and hostility factors (10) and also received more reports of aggression, delinquency, and cruelty (23). When comparing children divided into groups by their firesetting status (non, severe, and minor) several studies found higher levels of poor social skills and social judgment to be related to firesetting behavior (14,19,23,25).

A relationship between antisocial behavior and firesetting exists even when controlling for conduct problems (18). Studies conducted within community populations also support the finding that antisocial behavior is a strong predictor of firesetting. Martin et al (12) reported the odds of a juvenile with serious antisocial behavior setting a fire was seven times greater compared to a child who exhibits a low number of antisocial behaviors. Children and adolescents who set fires are also more likely to be involved with illegal drugs and display risk-taking behavior. Explaining why the relationships exist between Conduct Disorder, antisocial behaviors, delinquency, aggression, and firesetting is difficult, but it is not difficult to recognize that there is a relationship.

Children who set fires also exhibit more internalizing behaviors than their peers. Kolko and Kazdin (10) found that firesetters and match players received higher internalizing scores on the Achenbach Child Behavior Checklist when compared with inpatient cases, and the firesetting group rated internalizing problems higher than the other two
groups. Self-injurious behavior, suicidal thoughts, and suicide attempts are also found in higher rates among juveniles reporting involvement with fire and matches. In the same study both firesetters and match players received higher scores on self-injury measures than children who never played with fire or matches. Martin et al (12) also reported that firesetters report more suicidal thoughts when compared to peers who report no firesetting or fire play. In a study comparing juvenile arsonists and juvenile criminals, 74% of the arsonists reported suicidal thoughts and 44% reported attempting suicide (13).

No review of firesetting literature would be complete without discussion of research on the ego triad of firesetting, enuresis, and cruelty to animals. The ego triad was originally discussed by Yarnell (4) and MacDonald (28). The triad described that if the behaviors of cruelty to animals, bedwetting, and firesetting were all displayed by one individual there was a link to homicidal behavior (28). There is discrepancy in the research with some studies supporting the existence of a relationship between these behaviors and others find no correlation. Ritvo, Shanok, and Lewis (29) compared incarcerated male adolescent firesetters and incarcerated boys with no firesetting history on reports of cruelty to animals and bedwetting. They found that “only two of the 27 firesetters had a history of cruelty to animals and similar proportions of firesetters and non-firesetters were enuretic” (p. 265). A study by Showers and Pickrell (16) also indicated that a low percentage of children identified as firesetters in a study of 186 firesetters and 165 age and gender-matched controls exhibited the triad behaviors. On the other hand, cruelty to animals and others has been shown to correlate with firesetting severity and recidivism. Compared to non-firesetters, firesetters in a residential placement had a higher incidence of past physical violence and cruelty to animals. Sakheim and Osborn (19) and Slavkin (30) did identify that juveniles who were cruel to animals were more likely to engage in recidivistic firesetting and would be categorized as severe firesetters. Contradicting findings from Rasanen, Hirvenoja, Hakko and Vaisanen (13) found that when comparing juvenile criminals and juvenile arsonists that none of the violent offenders had ever committed arson.

The relationship of enuresis to firesetting is not as heavily studied but an investigation by Slavkin (30) reported that the level of “enuresis in the group of juvenile firesetters identified for the Marion County Arson Investigation Network Firestop program was higher than in a normative sample from a health survey” (p. 464). Overall, the ability of the ego triad to consistently predict violent behavior is weak but a relationship may still exist between the individual behaviors.

School functioning and attention characteristics

Cognitive, academic, and attentional characteristics also differentiate children and adolescents who set fires from their non-firesetting peers. Unfortunately, information on the cognitive functioning and academic performance of juvenile firesetters is more limited than research into the behavioral and psychological functioning of these children. Intelligence as measured by general intelligence tests does not appear to differentiate firesetters from non-firesetters, in samples from clinics, school populations, and random samples from the community (11,22,29, 31). Components of cognitive functioning, such as poor planning ability and poor understanding of cause and effect relationships, however, are associated with children who play with fire (19). In our experience, many children who set fires report that they did not expect the fire to spread or grow so quickly. Additionally, both younger children and adolescents say they did not think through what they would do to put the fire out prior to setting it. Their responses are representative of these facets of cognitive functioning.

Firesetters differ from other groups of children on school and academic performance in the few studies conducted utilizing school information. Firesetters and delinquent control groups are shown to have “poor academic performance, history of grade failure and truancy” (16, p. 498). Firesetting is a specific type of delinquent behavior; and, therefore it is not surprising that children who set fires have similar struggles in school as their delinquent peers.

Children who set fires are also have a higher incidence of ADHD. Studies suggest that the
associated impulsivity plays a role in a juvenile’s ability to inhibit their behavior and contributes to playing with lighters, matches, and firesetting. When comparing firesetters and non-firesetters, juvenile firesetters with impulsive behavior had less inhibition when compared to non-firesetters in a residential placement (19). Additionally, firesetters and children who played with matches have been rated higher in “emotionality, impulsivity and lower socialability than non-firesetters” (10, p. 196). Impulsivity also differentiates between firesetting groups based on severity with more severe firesetters and more persistent firesetters exhibiting more impulsivity (14). Of the juveniles referred to a fire setter intervention program in San Diego County, California “between 20-40% of the children had been diagnosed with ADD or exceed[ed] the criterion in the Diagnostic Statistical Manual – Fourth Edition” (32). Interestingly, in a study conducted by Showers and Pickrell (16) only 20% of firesetters received a diagnosis of Attention Deficit Disorder (ADD). Further research into the correlation of firesetting and ADD/ADHD would be beneficial to determine the extent that impulsivity plays a role in children’s firesetting behaviors. It would also be helpful to determine if management of ADD/ADHD symptoms would minimize firesetting as well.

Family and environmental factors

Research into the etiology of juvenile firesetting has investigated the environmental and familial characteristics that correlate with juvenile firesetting. Some studies find significant correlations between family composition, a child’s living environment, and the likelihood that they will set fires while others conclude that there is no difference.

Basic family demographics such as family size, median income, and family composition have been included in multiple studies. In a replication of their original study, Kolko et al (23) and Kolko and Kazdin (10) identified no significant difference in family demographic variables when comparing firesetters to other groups of children in hospitalized, inpatient, or psychiatric outpatient samples. Other studies investigating the parents’ marital status and the relationship of the adults in the home to the adolescent or child indicate there is a link with firesetting. Parent marital status does appear to predict a child’s involvement with fire. “Firesetters are more likely to come from families where parents had never been married and to live in a home with a step parent or significant other adult” (16, p. 497). In a study by Kosky and Silburn (31) comparing firesetters with children who had not set fires, two-thirds of the children identified as firesetters had parents who separated compared with one-third of the non-firesetters, 26% were living with their mother only and the other 31% were living with a biological parent and a step-parent (p. 252). Similar findings from Ritvo et al (29) indicate that even when comparing juvenile firesetters to incarcerated male juveniles with no fire history, the number of “firesetters with a biological mother in the home was significantly lower than the number of non-firesetters” (p. 263). More recent findings from Henderson and MacKay (8) examining firesetters in a juvenile firesetter intervention program show that a high percentage (66%) lived with at least one biological parent, although it is was not specified if the other biological parent was also at home or if the identified parent was the single caregiver. Similar findings from Kolko and Kazdin (9) indicate that only 12% of the children identified as firesetters resided with both biological parents. Kafry (22) found that children with both biological parents in the home have reduced incidents of firesetting. Children who “lived with both biological parents had a lower tendency to play with fire relative to children who lived in other family constellations” (22, p. 9). Overall these findings indicate that the family demographics and composition of who resides with the child does have relationship with firesetting behavior.

Several studies have found that a large percentage of families with children identified as juvenile firesetters fall into lower socioeconomic (SES) classes. Two studies by Kolko and Kazdin (11, 20) found approximately 60% of children in the identified firesetter group fell into lower SES classes and nearly 50% received public assistance. Henderson and MacKay (8) studied children involved with a firesetter intervention program and reported that “36% lived in households with annual incomes less than $20,000” (p. 132). Lack of supervision contributes to firesetting as an unsupervised child has the opportunity to play.
with matches or lighters without interference by a parent and this may be a factor in why children in families with lower socioeconomic status are more likely to set fires than their peers. When parents work long hours to just pay the bills or a single parent is juggling raising a family with working, these parents may not be able provide the same level of supervision as a “stay-at-home” mom or a home where there are two parents providing supervision.

Child-parent relationships have also been the subject of investigation to determine the basis for firesetting behavior. There is information from empirical studies suggesting that in many situations, fractured and stressed parent-child relationships exist when a child exhibits firesetting behavior. Several studies by Kolko and Kazdin (10,11) found that parents of firesetters reported more arguing and fighting with their child. “Power struggles are also more common between children identified as firesetters and their parents than non-firesetters and their parents” (19, p. 420). Not surprisingly, “parents of firesetters also reported less acceptance and less-child centeredness than parent of no fire children” (9, p. 234). Only a longitudinal study could determine whether parental acceptance existed prior to the firesetting or whether these parental behaviors were in response to challenging behaviors displayed by the child. Sakheim et al (14) and Sakheim and Osborn (19) studied the relationship characteristics of children with firesetting behavior that were living apart from their families, comparing children classified as extreme and minor risk firesetters and children with no firesetting history. In both studies, children in both the minor and extreme firesetter groups had intense anger over parental rejection and abandonment. Additionally, these children wished for a “reunion with their paternal figure, an absent father in the minor group” more than in the severe risk group. The researchers felt this desire to reunite with a parental figure may be stronger in the minor risk group due to their “better capacity to form attachments and experience object ties” (14, p. 500). Children in the minor and severe risk groups also expressed “revenge fantasies and anger “and were easily enraged. According to Sakheim et al (1991) children who lack attachments and who are “chronically angry” are more likely to act out and in the case of these children, set fires (p. 495).

Parental discipline is another environmental factor that predicts children who set fires. Two studies suggest that children who set fires come from homes with less structure, inconsistent rules enforcement, lax discipline, and less monitoring (7, 9). Unlike many of the previously mentioned studies, these studies were conducted with children from nonpatient, inpatient, and outpatient populations, suggesting a much more representative sample with more generalizable findings. Additionally, the parents of children who set fires have been found to utilize harsh discipline and ineffective mild punishment with no real repertoire of behavior management skills. A study by Ritvo et al (29) indicated that 18% of incarcerated adolescent firesetters had been burned severely at some point with some of the burns received as a form of punishment administered by an adult caregiver. One child reported having his “feet burned for lighting fires” and another was beaten with a hot spatula (p. 246). On the other end of the continuum, a study of preschool parents discovered that very few of the parents scolded or spanked their children for setting fires. Instead parents reported “talking to the child, feeling scared or angry, and calling emergency services” (33, p. 175). All of the findings suggest that better parent education is needed to enable parents of children who set fires to effectively deal with the behavior. It is unclear, however, whether the relationship between ineffective and inconsistent discipline and firesetting is causal or correlational.

Physical and sexual abuses along with a violent home environment are additional environmental factors that have been shown to relate to firesetting in children and adolescents. In some studies the level of abuse and neglect reported by juvenile firesetters is significant compared to other groups (16,34) but in studies where the comparison group is incarcerated juveniles or youth in mental health treatment programs the results are not significant (29). Becker et al (34) found that children from homes with marital violence were more than twice as likely to set fires than children from homes with no spousal violence. Additionally children from homes where a “spousal partner” hurt animals or drank more were more likely to start fires than children living in homes where this type of violence and alcohol use did not exist (p. 908). Showers and Pickrell (16) compared firesetters and non-firesetters from three populations; two state
psychiatric hospitals, mental health centers and a children’s hospital. They also reported that firesetters “experienced significantly more emotional neglect and physical abuse” (p. 498). These differences have not been found in studies comparing firesetters and incarcerated adolescents. Both incarcerated male adolescent firesetters and incarcerated males with no firesetting history reported similar percentages of abuse and violence in the home (29). In all of these studies, children and adolescents were selected from hospitals, juvenile justice facilities and mental health centers versus a more representative population so generalization of the results should be done with caution. The findings do however suggest that physical and sexual abuse is related to firesetting and is also commonly reported by incarcerated youths. Clearly the impact of abuse on children and adolescents has implications for multiple areas of their behavior.

Models of firesetting

Theoretical models of juvenile firesetting have been developed to explain the behavior and also guide research. The dynamic-behavioral and social-learning model of firesetting take multiple facets of a child’s life into consideration when assessing and intervening with the behavior. These two theoretical models integrate the many previously discussed characteristics in order to explain firesetting behavior. Additionally, the researchers responsible for these models created assessment tools that make the models particularly useful for clinicians working with this population of children and adolescents.

Dynamic-behavioral model. Dr. Kenneth Fineman’s work in the early 1980’s led to the development of the dynamic-behavioral model as described in Fineman (5,6). The dynamic-behavioral model looks at firesetting from multiple perspectives and seeks to identify many potential factors that can lead a child to set fires. Three sets of factors influential to child fire behavior are identified by Fineman (5) - personal and individual characteristics, family and social circumstances, and immediate environmental conditions. Firesetting is viewed as an “interaction between dynamic historical factors that predispose the firesetter toward a variety of maladaptive and antisocial acts, historical environmental factors that have taught and reinforced firesetting as acceptable, and immediate environmental contingencies that encourage firesetting behavior” (35, p. 18). Maladaptive coping and behaviors are only one piece of the puzzle when viewing firesetting from a dynamic-behavioral perspective.

This theory and model is unique in that it is “constructed to explain firesetting” and instantaneous environmental reinforces are considered. These include “impulsivity triggers” such as anger or rejection and crime scene variables that provide insight into the “goals” of the firesetting behavior (36, p. 231). Firesetting aimed at a property or person is viewed differently than a child playing with matches. Responses to the firesetting and the child’s thoughts prior, during, and following the firesetting behavior are also investigated.

The dynamic-behavioral model is clinically useful. It helps a practitioner identify the factors related to a child’s individual characteristics, family and social circumstances, and environment that make a child at risk for firesetting. Fineman’s assessment forms can be used by professionals to assess children and adolescents in the three areas contributing to the behavior as well as the sequence of events surrounding the firesetting. The Comprehensive Fire Risk Evaluation (6) and the Juvenile Firesetter Child and Family Risk Surveys (37) are both assessment instruments based on this model that can be used to assess a child’s firesetting behavior. These instruments provide information about the function and goals behind a child’s firesetting behavior. Separate family and child measures provide useful information in identifying discrepancies in the perspectives of the caregivers compared to the responses of the child. As mentioned previously, the risk of future firesetting in this model is related to ”history of firesetting, severity of psychopathology, motive and intent to harm underlying the act and the firesetter’s post offense response” (36, p. 233). Using the forms and interviewing the child and caregiver separately can provide valuable information about all of these areas. The forms also serve as a guide for intervention and referral (38). The Federal Emergency Management Agency (FEMA) and the National Fire Academy (NFA) utilize these forms in their juvenile
firesetter intervention curriculum. It should be noted that there is some argument about the validity and reliability of these measures. Specifically, no normative data has been compiled for these measures and FEMA has not conducted any data analysis on information collected (39).

**Social learning model.** Social learning theory originally was described by Albert Bandura in the 1970s and was integrated into a juvenile firesetting model by Kolko and Kazdin (40). Social-learning is an influential theory in shaping our understanding of the firesetting problem, with implications for identifying children based on risk and treatment design.

Bandura’s social learning theory is founded on his belief that people can learn by watching others and that violence is environmentally influenced. Social learning theory also considers how reinforcement, either intrinsic or extrinsic, increases the likelihood of a behavior. Kolko and Kazdin’s (1986) social learning model of firesetting builds on this premise. Several factors and three domains are identified within this model. The three domains are

- learning experiences and cues,
- personal repertoire, and
- parent and family influences and stressors.

These domains and their individual, environmental, and behavioral components are utilized to determine the “tentative risk” of the child who is setting fires (38, p. 51).

Kolko and Kazdin (20) have created several semi-structured interviews to assess varying risk factors related to firesetting based on the social learning model. The Firesetting Risk Interview assesses personal, familial, and social dimensions related to firesetting and the Children’s Firesetting Interview evaluates the child’s knowledge of fire, their exposure to fire through others, and supervision and discipline (41). These instruments are reported to have good re-test reliability and internal validity.

The social learning model shares conceptual themes with the dynamic-behavioral model. Both the social-learning and dynamic-behavioral models look at a child’s experiences, individual characteristics, and environment when assessing firesetting risk. Firesetting is also viewed as an outcome “of an interaction between individuals and their social and physical environment” (42, p. 37). The social-learning model requires practitioner to look for individual risk factors as well as situational risk factors. A strong example of the social learning model as it relates to juvenile firesetting is the statistic that “one contributing factor to the predominance of children involved in lighter and match fires is smoking. If one or more of a child’s parents smoke, matches or lighters may be more readily available in the home. A child in a home with a smoker is twice as likely to be involved with fire play as a child in a home with a nonsmoker (43). In this example, utilizing the social learning model of juvenile firesetting, a practitioner would consider that the child had seen their parents smoking and from this vicarious experience learned how to use the lighter.

The models discussed have contributed greatly to the understanding of firesetting behavior. In many ways, the complexity of the behavior is also reflected in the many areas of assessment addressed by the social-learning and dynamic-behavioral models. Not only are a child’s individual characteristics important when analyzing firesetting, but also their previous experiences, family, and environment.

**Gaps in the research**

While there has been significant research on juvenile firesetting in the past 20 to 30 years, gaps in the literature remain. Most of the research has focused on individual, environmental, and family characteristics of children who set fires. This section will discuss the lack of research on juvenile firesetters’ academic and school functioning as well as the relationship between attention problems and firesetting. Finally, the lack of large samples will be reviewed.

Many specific facets of cognitive functioning have been cited as contributing to firesetting behavior, however, little research has specifically looked at overall cognitive abilities of these children, and even fewer studies have investigated academic and school functioning. A handful of researchers (11,22,29,31) have investigated differences in the overall intelligence quotients between firesetters and non-firesetters in samples from clinics, school populations and community venues. These studies found no
difference in overall cognitive functioning. Other studies pulling out aspects of cognitive ability such as formal operations, planning ability and understanding of cause and effect relationships do reveal differences between children identified as firesetters and those who had not set fires (19,44). The scarcity of such studies is a significant gap in the research on firesetting.

Even less is known about how children who set fires perform academically. Showers and Pickrell (16) found that both firesetters and children in a delinquent control group both showed poor academic performance, a history of failing grades, and truancy. Two studies by Kafry (22) and Kolko and Kazdin (10) found that firesetters can be differentiated from their peers academically and have depressed social skills and behavior problems. These limited studies suggest that firesetters are differentiated from other children in the classroom, just as other children with behavioral challenges can be identified. Unfortunately, with the exception of these few studies, little has been done to assist teachers in identifying a child who is at-risk for firesetting in the same way efforts have been taken to identify children at-risk for other types of violence. This is very unfortunate given that during the 2003 to 2005 school year, 14,700 fires that required the fire department to respond occurred on school properties (45). The primary cause of fires in schools is incendiary, meaning most fires occurring in schools are intentionally set versus accidental. These statistics are not surprising. Children who have access to lighters at home can easily bring them to the school and set fire to toilet paper or trash in a waste basket.

Studies conducted with large samples populations are rare. Of the studies examined, the majority utilized sample sizes of less than 200 individuals, ranging from 17 to 192 (18,46). Only three had datasets contained more than 1,000 individuals (12,31,47).

Summary of literature review

Much of the research on juvenile firesetting has focused on identifying characteristics and typologies of children who set fires and explaining the etiology of the behavior. The dynamic-behavioral and social-learning models have been developed to understand firesetting behavior. Both theories propose that firesetting is a result of many factors including; personal and individual characteristics, family and social circumstances, and immediate environmental conditions.

Although significant progress has been made in understanding why children set fires, gaps in the research remain. Much of the previous research on the characteristics of children who set fires is based on small samples from clinical, hospital or referred populations. Children whose firesetting behavior is this severe may not be representative of the children typically referred to fire departments, guidance counselors, and local community health agencies. Although the information gained from these studies provides insight, the generalizability of the results can be questioned. Finally, there has been little research on the school and academic experiences of children who set fires, including their academic performance, attention, impulsivity, and hyperactivity. Acknowledging the complexity of the roots and actions of firesetting behavior means looking at all components of a child’s life. Children and adolescents spend half their day at school. Further understanding the relationship between academic and school functioning and firesetting may shed additional light on why some children set fires and some do not.

Purpose of this study

The purpose of this study was to examine the characteristics of children who set fires and then further identify if school related variables are predictive of this behavior. The academic and school functioning of children identified as firesetters has only been minimally researched and therefore discovering differences in the academic and school functioning of self-reported firesetters and non-firesetters would be relevant for teachers and school-based mental health practitioners. Although ADHD and firesetting has been better studied, the findings are mixed. Further investigation of self-reported attention problems will lead to further understanding of whether impulsivity plays a role in firesetting. On a broader scope, the true prevalence of juvenile firesetting behavior needs additional inquiry. Most
fires set by children and adolescents are never reported to a fire department due to the parents not discovering the child’s behavior or caregivers choosing not to report this behavior to authorities.

The hypotheses for the research questions are based on the research literature and the need to investigate predictors of juvenile firesetting that are less studied. The first hypothesis addresses gaps in the research regarding the academic and school functioning of children who also report firesetting behavior. The second hypothesis examines attention problems and their relationship to firesetting. Multiple studies have found that impulsivity is associated with firesetting (14,19,20,22) and the research also indicates that a diagnosis of ADHD is associated with firesetting. Hypothesis three relates to the prevalence of self-reported firesetting in a large data set consisting of a random sampling of children from across the country. Previous studies conducted with normative populations from smaller geographic areas (a city or school district) provide a variety of prevalence rates. The final hypothesis also relates to self-reported firesetting in a large national data set and associations with internalizing, externalizing, and overall total problems reported by firesetters and non-firesetters.

The following research questions defined the study:

- After controlling for gender, age, and race can a child’s academic performance predict whether the child will or will not set fires?
- After controlling for gender, age, and race, are children with attention problems more likely to set fires?
- Two secondary questions were included due to the availability of a large normative data set that also recorded an adolescent’s reports of firesetting.
- What is the prevalence of firesetting in a national normative population?
- Are the characteristics of children who set fires in a national, normative population consistent with the characteristics reported in the literature from clinical, inpatient, and outpatient samples?

Hypotheses related to each research question were as follows:

1. A youth’s academic performance in school as measured by academic grades will predict the likelihood that the child engages in firesetting behavior after controlling for gender, age, and race.

   \[ \text{Age + Race + Gender + AcademicPerformance} \rightarrow \text{Firesetting} \]

1a. A second portion of this question and hypothesis addressed the relationship between a child’s attitude toward school and firesetting and the influence of the child’s attitude on their academic performance.

   \[ \text{Age + Race + Gender + SchoolAttitude} \rightarrow \text{Firesetting} \]

2. Overall reported attention problems and ADHD symptoms will predict firesetting after controlling for gender, age, and race. The parent’s and child’s ratings in both areas were utilized as predictor variables.

   \[ \text{Age + Race + Gender + Attention} \rightarrow \text{Firesetting} \]

   \[ \text{Age + Race + Gender + ADHD} \rightarrow \text{Firesetting} \]

3. More males than females will report setting fires, with low prevalence in general when examining the second larger normative sample data.

4. Internalizing problems, externalizing problems, and total problems will be associated with firesetting and firesetters in the second normative sample dataset. Poor academic performance, attention problems and ADHD symptoms will also be associated with firesetting.
Methods

This study utilized existing data samples for the Achenbach System of Empirically Based Assessment (www.aseba.org). The ASEBA is a comprehensive system that has been researched and used widely since first introduced in 1965. The various rating forms document both qualitative and quantitative information and include descriptive data, plus competence, adaptive and problem scores. The ASEBA is used in a variety of settings, including schools, medical facilities, public health agencies, and other social and mental health services (www.aseba.org). Additionally, the ASEBA has been used in multiple studies on juvenile firesetting (25,48-53). Several prominent manuals on juvenile firesetting also recommend the inclusion of the ASEBA report forms in the assessment of children who set fires (19,35,54).

The Youth Self Report/11-18 (YSR) and Child Behavior Checklist (CBCL) data were analyzed for this study. Both the Factor Analysis dataset and the National Survey dataset contain the responses from these forms. The CBCL for children ages 6-18 years is completed by parents or surrogates and the YSR for ages 11-18 years is completed by the youth. Cross-informant data was utilized to gather as much information as possible about adolescents who set fires.

The Youth Self Report includes 112 items and the CBCL includes 113 individual items. The juvenile or parent/surrogate is asked to rate each item on a scale. Both use a 3-point Likert scale that ranges from 0 (not true) to 2 (very true or often true). Both forms yield scores for the Empirically Based Syndrome Scales, DSM-Oriented Scales and Competence Scales. The Empirically Based Syndrome Scales are: Anxious/Depressed, Withdrawn/Depressed, Somatic Complaints, Social Problem, Thought Problems, Attention Problems, Rule-Breaking Behavior, and Aggressive Behavior. DSM-oriented scales are: Affective Problems, Anxiety Problems, Somatic Problems, Attention Deficit/Hyperactivity Problems, Oppositional Defiant Problems, and Conduct Problems. The Syndrome Scales are reported as t-scores. Scores of 65 to 69 are considered to be in the borderline clinical range and scores above 70 are within the clinical range. The Competence Scales reflect a child’s competence in different areas. The four reported Competence Scales are: Activities, Social, School, and Total Competence. On the YSR, the self-ratings of school performance are reported as the mean performance under Academic Performance and a School Competence score is not provided. In the datasets used for this study, scores for the Competence Scales were not included in the data. Communication received from the research consultant with ASEBA indicated that these “data are unavailable from the Research Center for Children, Youth and Families” (55).

Firesetting behavior is addressed on the YSR and the CBCL forms. This question appears as item #72 “I set fires” and “sets fires” on the two forms respectively. The question is rated 0 to 2 and falls under the Rule-Breaking Behavior Scale. The directions indicate that the juvenile and parent/caregiver should rate firesetting behavior in the past six months so only recent firesetting behavior is captured. Item #72 is also considered a critical item that indicates a high risk or safety issue.

Several scales were used in this study including the Attention Problems, ADHD, Externalizing, Internalizing and Total Problems scales. The raw scores for these scales were utilized in the analyses. The Manual for the ASEBA School-Age Forms and Profiles (56) recommends using the raw scores for research due to the way T-scores were assigned. There is a truncation of scores that are at or below the 50th percentile when the T-scores were developed (p. 89). This truncation results in a loss of differences among low scores since raw scores of 0, 1, 2, 3, and 4 may have a T-score of 50 on one scale and scores of 0 and 1 may have a T-score of 50 on another scale. Additionally, T-scores above 70, or 98th percentile were assigned with as many increments as possible given the raw scores obtained for each scale.

The Manual for the ASEBA School-Age Forms and Profiles (56) provides information about the psychometric properties of the ASEBA rating scales including the internal consistency data, test-retest reliability of scale scores, and cross informant agreement between scale scores. The reliability of the item scores are reported as the intraclass correlation coefficient. According to Lu and Shara (57) the “best measure of reliability for continuous data is the intraclass correlation coefficient [ICC]” (57). The ASEBA
manual (56) indicates that the ICC was utilized because it captures differences in both the rank ordering of scores and also differences in the magnitude unlike the Pearson (r) or tests of difference. The inter-interviewer reliability of items scores was evaluated although the rating scales are designed to be self-administered. The ratings of three interviewers were compared on 723 children. “The overall ICC was .93 for the 20 competence items and .96 for the 188 specific problem items on the CBCL” (54, p. 100). With a range of 0 (low reliability) to 1 (high reliability) these ICC values indicate “very high inter-interviewer reliability” (54, p. 100). Test-retest reliability is reported for items and scale scores. The test-retest reliability of item scores was computed from 72 CBLCs using the ICC. They were completed with an interviewer and mother of the youth at a one-week interval. Only non-referred children were assessed. “The overall ICC was 1.00 for the 20 competence items and .95 for the 188 specific problem items” (56, p. 100). This indicates very high test-retest reliability in item scores (54, p. 100). The test-retest reliability of scale scores was computed using Pearson correlations (r) and mean differences tests between CBCL ratings by parents and the YSR ratings by youths. The test-retest reliability was high for the scales selected with a range of .82 to .94 on the CBCL and .80 to .91 on the YSR.

Information about the internal consistency of scale scores is also reported in the ASEBA manual (56). The Cronbach’s alpha (α) for each scale is reported and provides a measure of how well “a scale will produce the same results on different occasions when the behavior is expected to remain constant” (56, p. 100). The CBCL scales which were selected for this study had α values ranging from .63 (scale) to .97 (scale). These are considered moderately high to high. The internal consistency was higher on the Internalizing, Externalizing, and Total Problems; α ranged from .90 to .97. The α for the YSR scales selected range from .72 to .95. Again, the highest consistency was found on the Internalizing, Externalizing, and Total Problems scales which consist of many items although the Competence Scales also received high α ranging from .83 (scale) to .91 (scale) (56, p. 101).

Cross-informant agreement information is also provided in the ASEBA manual. Of relevance to this study, CBCLs completed by mothers and fathers of children referred for a mental health services and combinations of CBCLs and YSR for children in the national survey and in mental health settings were compared. The between parent Pearson correlations ranged from .57 to .85 for the scales used in this study. Mothers tended to rate their children higher than fathers on problem scales (56, p. 103).

Data sets

Two different data sets available from ASEBA were utilized for this study: the National Survey Data and the Factor Analysis Data. The National Survey dataset is data derived from the 1999 National Survey of Children, Youth, and Adults conducted by Temple University’s Institute for Survey Research. This data set was utilized to address secondary research questions 3 and 4 and investigate the prevalence of self-reported firesetting as well as some of the characteristics associated with this behavior in a larger sample. For the development of this dataset individuals were selected from 100 areas representative of the contiguous 48 states in the United States. The eligible residents were selected by “stratified randomized procedures” to generate the desired age distribution and similar proportions of each gender for each age. The final sample contained in the National Survey includes children and adolescents from 40 states and the District of Columbia.

The data set utilized to address the main research questions is the 1999 Factor Analysis Data set and is derived from the National Survey population. The Factor Analysis set “consists of referred people and non-referred people with high Total Problem scores from the National Survey” (56, p. 74). In order to identify high scorers the median Total Problems score was identified for boys and girls in the 1999 National Survey sample. The children selected to be included in the Factor Analysis sample were those whose Total Problems score was above this median (56, p. 82). These “referred and non-referred people” consist of individuals pulled from the larger National Survey Data set and an additional group of youth from 13 outpatient and inpatient mental health services. Individuals included were from 40 US States, the
District of Columbia, one Australian state, and England. The children from the National Survey which are included in the Factor Analysis Data Set received high Total Problem scores but may or may not be receiving services.

The data sets were obtained directly from ASEBA. The initial data contained only raw responses in syntax format, no Scale Scores and cases did not have unique identifiers. Four separate data sets were received: Factor Analysis Youth Self-Report responses, Factor Analysis CBCL responses, National Survey Youth Self-Report responses and the National Survey CBCL responses. Formatting of each of the four data sets was required to generate scale scores. The files were then reformatted into .dat files and sent back to the ASEBA research consultant. These files were then processed through the ASEBA A2S software. Adaptive Scale scores could not be generated by the ASEBA research consultant. ASEBA also indicated that the Adaptive and Competency data was unavailable from the Research Center for Children, Youth and Families (55). The files were then converted to SPSS format.

Generating unique identifiers was also necessary to match YSR cases with their corresponding CBCL responses in each respective dataset. The data sets that this author received had duplicate case numbers. Due to these duplications, cases were matched on multiple demographic variables and response dates to ensure that correct pairings occurred. The cases were then assigned a unique identifier. Cases were excluded if demographics that would enable identification were missing and if the Youth Self-Report could not be matched with a parent/guardian case.

Results

The primary questions of interest in this study relate to academic performance and attention. Specifically, are academic and attention problems predictive of firesetting? The relationship between these areas and firesetting behavior is less well studied than other characteristics of firesetters, and the findings are also relevant to school psychology practice.
Firesetting

Item #72 (I set fires) served as the dependent variable. The original range of possible responses to the question “I set fires” was a 3-point Likert scale ranging from 0 (not true) to 2 (very true or often true). Firesetting was recoded for this study to a dichotomous variable with 0 (no firesetting) and 1 (firesetting). This recode was done for several reasons. The original scale of this question hints at the severity of firesetting but does not give parameters; therefore, a score of 2 for one juvenile may not be as severe as a 2 rating for another juvenile. More importantly, it is this author’s opinion that any incident of firesetting can have severe consequences so the distinction between “somewhat or sometimes true” and “very true or often true” is irrelevant since any instance of firesetting or fireplay is dangerous. Children were coded as firesetters if they reported “somewhat” or “often” true that “I set fires.” Children were only coded as non-firesetters if they responded “0”, that they do not set fires. As expected, the majority of children and parents reported no firesetting behavior (n = 852 and n = 887, respectively) in the Factor Analysis sample. The adolescents self-reported more firesetting than their guardian/caregiver. Of the 123 children who did report setting fires, only 32 reported that the “I set fires” statement was “very true” of them. After recoding, over 12% of the total respondents reported some level of firesetting behavior (n = 123).

Independent variables

The predictor variables for the first two research questions included demographic variables and the predictor variables of interest for each hypothesis. Created scales representing academic performance and attitude toward school and variables measuring attention and ADHD symptoms were identified for inclusion in this study.

Demographics

Demographic information utilized included age, gender, and race variables. For the factor analysis sample, 40.6% of the individuals were female and 59.4% were male. (n = 396 and n = 579, respectively). Gender was recoded as 0 (female) and 1 (male). The original race variable consisted of six groups. This variable was recoded as (race) with three groups: Caucasian, African American and other (n = 381, n = 164, and n = 301). See table 3 for firesetting category by gender and race.

Table 3. Frequency of firesetting by gender and race

<table>
<thead>
<tr>
<th>Firesetting Reported</th>
<th>Males</th>
<th>Females</th>
<th>Caucasian</th>
<th>African American</th>
<th>Other Race</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (1)</td>
<td>99</td>
<td>24</td>
<td>40</td>
<td>13</td>
<td>45</td>
</tr>
<tr>
<td>No (0)</td>
<td>480</td>
<td>372</td>
<td>341</td>
<td>151</td>
<td>256</td>
</tr>
</tbody>
</table>

Note: Factor Analysis sample.

The Youth Self-Report is utilized with children and adolescents age 11 to 18. In the Factor Analysis sample, the mean age was 13.63 (SD = 2.06). The mean age for females was 14.09 years (SD = 2.16) and the mean age for boys was 13.32 years (SD = 1.93).

The raw data received from ASEBA did not contain any scales scores for academic performance or overall competence. Several scale reliability analyses were conducted to identify items that represented academic performance with good reliability prior to creating the final scale for academic performance. Eight items were included in the final academic performance scale, four from the YSR and four from the CBCL. These items rated a child’s academic performance in Language Arts/Reading/English, History/Social Studies, Arithmetic/Math, and Science. The rating scale is a Likert scale ranging from 1 (failing) to 4 (above average). Prior to creating the scale, each item was reverse coded with the range being 1 (above average) to 4 (failing). This recode was completed so the
direction of the scale was consistent with other scales in the ASEBA data where a higher value represents more problems or negative symptoms. The Cronbach’s $\alpha$ for the created Academic Performance scale is .87. Both the child and parent ratings were included since the Cronbach’s $\alpha$ for the scale decreased if any item was deleted. Reference table 4 for descriptives of the Academic Performance scale. This scale rates a child’s academic performance as measured by their grades in the main subject areas.

Table 4. Descriptives for predictor variables in academic regression

<table>
<thead>
<tr>
<th></th>
<th>Age in Years</th>
<th>Academic Performance</th>
<th>Attitude toward School</th>
</tr>
</thead>
<tbody>
<tr>
<td>$N$ Valid</td>
<td>975</td>
<td>704</td>
<td>975</td>
</tr>
<tr>
<td>$N$ Missing</td>
<td>0</td>
<td>271</td>
<td>0</td>
</tr>
<tr>
<td>Mean</td>
<td>13.63</td>
<td>2.16</td>
<td>0.60</td>
</tr>
<tr>
<td>$SD$</td>
<td>2.06</td>
<td>0.63</td>
<td>0.44</td>
</tr>
</tbody>
</table>

*Note: Factor Analysis Sample.*

Table 5. Descriptives for predictor variables of ADHD and attention

<table>
<thead>
<tr>
<th></th>
<th>Attention</th>
<th>ADHD</th>
<th>Attention</th>
<th>ADHD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Youth</td>
<td>Youth</td>
<td>Parent</td>
<td>Parent</td>
</tr>
<tr>
<td>$N$ Valid</td>
<td>974</td>
<td>974</td>
<td>974</td>
<td>974</td>
</tr>
<tr>
<td>$N$ Missing</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mean</td>
<td>8.03</td>
<td>6.85</td>
<td>63.99</td>
<td>6.74</td>
</tr>
<tr>
<td>$SD$</td>
<td>3.09</td>
<td>7.22</td>
<td>9.81</td>
<td>3.49</td>
</tr>
</tbody>
</table>

*Note: Factor Analysis sample.*

**Attitude toward school**

This scale was created after examining item groupings for the Academic Performance Scale. There were multiple items on the rating forms that addressed school work, behavior at school, or attitude toward school but lowered the reliability for the academic performance scale. Six items specifically grouped together to measure a child’s general demeanor or attitude toward school such as “My school work is poor,” “I cut classes or skip school,” and “I disobey at school.” These items are again rated on the same Likert scale from 0 (not true) to 2 (very true or often true), with higher values representing a more negative construct. Although these items do not measure a child’s grades, they assess another facet of a child’s performance at school and therefore this scale was included for additional analysis. The Attitude toward School scale (SchoolAttitude) has a Cronbach’s $\alpha$ of .70. See table 4 for additional descriptive information for this scale.

**Attention problems**

The Attention Problem scale (Attention) consists of items such as “fails to finish,” “can’t sit still,” and “poor school work.” The raw score for this scale was utilized for hypothesis two to look at attentional problems that related to school functioning and may also contribute to firesetting. Both the YSR Attention Problems ($N = 974, M = 8.03, SD = 3.09$) and CBCL Attention Problems ($N = 974, M = 8.55, SD = 4.43$) raw scale scores were used. The CBCL has a Pearson ($r$) of .92 and Cronbach’s $\alpha$ of .86. The YSR has a Pearson ($r$) of .87 and Cronbach’s $\alpha$ of .79 (56, p. 101). Reference table 5 for a summary of the descriptives for these scales.

**Attention deficit/hyperactivity problems**

This scale (ADHD) consists of items that are consistent with a DSM diagnosis of Attention Deficit Disorder or Attention Deficit Hyperactivity Disorder. High scores on this scale are suggestive of either ADD or ADHD. The raw scale scores from the YSR
Procedures to investigate academic performance and firesetting

The first hypothesis investigated if any academic performance (Academic Performance) differences exist between firesetters and non-firesetters and if a child’s academic performance is predictive of firesetting.

Preliminary analyses were run on the predictor variables to determine the relationship between the variables and the presence of any confounding variables. The variables to include in the model had already been identified based on the research and focus of this study so the purpose of these initial analyses were to gain a better understanding of the data prior to using the variables in the full regression model.

The main analysis was performed utilizing logistic regression to determine if academic performance is predictive of firesetting when controlling for demographic variables and with consideration of confounding factors.

A secondary analysis was conducted using the Attitude toward School scale in a logistic regression as the explanatory variable and then in a logistic regression controlling for attitude toward school. These additional logistic regressions were done to examine if a child’s truancy, disobedience, and perception of their academic grades was predictive of firesetting and then if academic performance was predictive of firesetting when controlling for demographic variables and the child’s attitude toward school.

Results of analyses examining academic performance and firesetting

The first research hypothesis addressed the relationship between academic performance and firesetting. It was expected that academic problems would be predictive of firesetting but to what extent poor school performance would increase the likelihood of firesetting was unknown. Also unknown was whether poor attitude to school would predict firesetting.

Preliminary analyses were conducted to determine if all initially selected variables should be included in the regression. The first variable to be examined was gender (Gender). When comparing males and females utilizing independent samples t-tests to compare means on the academic performance (Academic Performance) variable, it was found that boys have poorer academic performance (M = 2.24, SD = .62). The difference was statistically significant at the p < .001 level. A logistic regression was then run to examine the relationship between gender and firesetting. The odds of firesetting decrease by 69% if a child is female, compared to a male. This was significant at the p < .001 level. This information indicated that gender is associated with both academic performance and firesetting and therefore it was determined that it was appropriate to include gender in the regression as planned.

The race variable (Race) was also analyzed separately in relation to academic performance (Academic Performance) and firesetting. A one-way ANOVA revealed significant differences between the groups, F (2,682) = 14.47, p < .001. Caucasian children reported higher academic performance and children who were not Caucasian or African American reported the worst academic performance. A logistic regression for race (Race) and firesetting (Fires) revealed no statistically significant difference (p = .08) between the three groups. Due to the relationship between race and academic performance, race was included in the regression model as a control variable.

A youth’s age was also examined in relationship to academic performance and firesetting. A one-way ANOVA revealed no statistically significant difference between age groups when looking at academic performance reports (Academic Performance). F (7, 696) = 1.17, p > .05. A logistic regression for the age and firesetting was then conducted. The odds of a child reporting firesetting behavior are .92 times less for every one year increase in the child’s age; however, this was not statistically
significant (p = .08). Although this result was not significant at the p < .05 level, the low significance level (p = .08) was unexpected given what is known about age as it relates to firesetting behavior. Further analysis was done examining the age variable. Since this sample contains adolescents age 11 to 18 years-old the relationship between gender and age was examined to determine if the males and females were equally represented across ages. An independent samples t-test revealed that the females were a little older on average (M=14.09, SD=2.162) than males (M =13.32, SD = 1.96) in this sample (see figure 1). This difference was significant t (973) = 5.84, p < .001. The determination was made to exclude age from the predictors included in the full logistic regression because the association between firesetting and age in this sample was a function of gender, which is known to be predictive of firesetting.

![Figure 1. Box Plots of Gender (X-axis) and Age (Y-axis) in factor analysis dataset. Age distribution of males and females within the factor analysis sample. There were more older females then males in the sample.](image)

The relationship between an adolescent’s academic performance and attitude toward school was also examined to further determine if this scale should be included in the regression model. As expected a child’s attitude toward school (SchoolAttitude) and academic performance (AcademicPerformance) were significantly correlated with r = .583, p < .01. Although there is a strong correlation between these two variables, the determination was made to include the Attitude toward School variable in the regressions because this scale measures a different aspect of academic performance. The main focus of this study was to address gaps in the research and it is this author’s opinion that the Attitude toward School scale captures another important part of a child’s functioning at school.

The main analyses included three separate regressions to fully explain the relationship between academic performance and firesetting. The first regression was run with race and gender as controls to determine if academic performance (as measured by grades) was predictive of firesetting. Attitude toward school was included in a second regression as the explanatory variable and a third regression as a control to determine if academic performance was predictive of firesetting even when controlling for demographics and attitude.

\[ \text{Race} + \text{Gender} + \text{AcademicPerformance} \rightarrow \text{Firesetting} \]
\[ \text{Race} + \text{Gender} + \text{School Attitude} \rightarrow \text{Firesetting} \]
\[ \text{Race} + \text{Gender} + \text{School Attitude} + \text{AcademicPerformance} \rightarrow \text{Firesetting} \]

Results of the initial logistic regressions indicate that academic performance was a significant predictor
of firesetting behavior (p < .05) when controlling for gender and race. When considering two children of the same race and gender, the odds of setting fires increases by 46% for every one unit increase in rating of poor academic performance on the Academic Performance scale (or a factor of 1.46), as can be observed in table 6.

**Table 6. Logistic regression for academic performance and firesetting**

<table>
<thead>
<tr>
<th>Predictors</th>
<th>β</th>
<th>SE</th>
<th>Sig.</th>
<th>Exp(β)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>-1.19</td>
<td>0.30</td>
<td>.000***</td>
<td>0.30</td>
</tr>
<tr>
<td>White</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>African American</td>
<td>- 0.64</td>
<td>0.40</td>
<td>0.107</td>
<td>0.53</td>
</tr>
<tr>
<td>Other</td>
<td>0.26</td>
<td>0.27</td>
<td>0.342</td>
<td>1.29</td>
</tr>
<tr>
<td>Academic Performance</td>
<td>0.38</td>
<td>0.19</td>
<td>0.049*</td>
<td>1.46</td>
</tr>
</tbody>
</table>

*Note: Controls are Gender and Race. Factor Analysis Sample (N = 685).*  
Block 1: Nagelkerke $R^2 = .08; \chi^2(3) = 26.63; p < .001$  
Block 2: Nagelkerke $R^2 = .09; \chi^2(4) = 30.41; p < .001; *p \leq .05; **p \leq .01; ***p \leq .001.$

A regression was then run to examine whether attitude toward school alone was a significant predictor of firesetting. It was found that for every one unit increase in a child’s poor attitude toward school, the odds of being a firesetter increase by a factor of 3.4. Due to these results and the identification of school attitude as a predictor and also as a possible confounding variable, a logistic regression was run to determine if academic performance would remain a significant predictor even when controlling for attitude toward school.

School Attitude was entered as a control variable after race and gender to investigate whether controlling for an adolescent’s rating of truancy, disobedience and their view of their academic performance would affect the predictive ability of academic performance (as measured by a child’s grades.) The logistic regression results change when entering school attitude as a control variable and including academic performance as the explanatory variable. The significance of academic performance as a predictor of firesetting changes from $p = .049$ to $p = .478$ with an odds ratio change from 1.46 to .85 (see table 7). When comparing two children of the same gender, race, and with the same reported attitude toward school, academic performance is no longer a significant predictor of firesetting.

**Table 7. Logistic regression for academic performance and firesetting controlling for attitude toward school**

<table>
<thead>
<tr>
<th>Predictors</th>
<th>β</th>
<th>SE</th>
<th>Sig.</th>
<th>Exp(β)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>-1.00</td>
<td>0.31</td>
<td>.001***</td>
<td>0.37</td>
</tr>
<tr>
<td>White</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>African American</td>
<td>- 0.67</td>
<td>0.40</td>
<td>.097</td>
<td>0.51</td>
</tr>
<tr>
<td>Other</td>
<td>0.20</td>
<td>0.28</td>
<td>.469</td>
<td>1.22</td>
</tr>
<tr>
<td>School Attitude</td>
<td>1.47</td>
<td>0.33</td>
<td>.000***</td>
<td>4.34</td>
</tr>
<tr>
<td>Academic Performance</td>
<td>-0.17</td>
<td>0.23</td>
<td>0.478</td>
<td>0.85</td>
</tr>
</tbody>
</table>

*Note: Controls are Gender, Race and School Attitude. Factor Analysis Sample (N = 685).*  
Block 1: Nagelkerke $R^2 = .08; \chi^2(3) = 26.63; p < .001.$  
Block 2: Nagelkerke $R^2 = .14; \chi^2(4) = 49.48; p < .001.$  
Block 3: Nagelkerke $R^2 = .14; \chi^2(5) = 49.48; p < .001.$  
*p \leq .05; **p \leq .01; ***p \leq .001.
Procedures to investigate attention problems, ADHD, and firesetting

The second research hypothesis addressed the relationship between a child’s firesetting behavior and attention problems. The ASEBA rating forms yield one scale for Attention Problems and another that measures clinical symptoms of ADHD. These scales are present on the Youth Self-Report and Parent Rating forms. The ASEBA research consultant and the ASEBA Manual for School – Age Forms and Profiles (54) recommend utilizing the raw scores for research due to the way that raw scores were converted to T-scores. Raw scores below the 50th percentile were all given a T-score of 50 so for one scale this may represent raw scores of 0, 1, 2, 3, and 4 while on another scale a T-score of 0 and 1. On the high end of raw scores, T-scores were assigned in as many increments as possible. Use of raw scores is therefore recommended due to this truncation on the lower end of scores and spread of higher scores. Correlations and descriptives were run to determine if the youth and parent scores were similar or varied significantly. The correlations were significant at p < .01, when comparing the individual scales across raters (ranging from r = .30 to .36).

Several initial analyses were run to look at the relationship between the control and predictor variables and firesetting in order to check for confounding variables and better understand the variables. Initial t-tests were run to examine gender differences in attention problems (AttentionProbs_raw) and (ADHD_raw) using both the adolescent self-report and the parent rating.

Next, one-way ANOVAs were run to look at the relationship between race, attention problems, and ADHD symptoms. The relationship between race and firesetting had previously been examined during the initial analyses for hypothesis one so this process was not repeated.

Final logistic regressions were run to fully address hypothesis two. First, the child’s and parent’s ratings of attention problems were entered into a logistic regression model after controlling for demographics. The child and parent’s ratings of ADHD symptoms were also utilized in logistic regressions to determine if a child’s or parent’s ratings were more predictive of firesetting.

Results of analyses examining attention problems, ADHD, and firesetting

The second research hypothesis addressed whether an adolescents attention problems and/or ADHD were predictive of firesetting. The results of the initial analyses to examine the relationships between the predictor variables and firesetting identified several confounding variables. The gender groups were compared on the four attention scales. Boys and parents of boys reported significantly more attention problems and ADHD symptoms than females (see table 8). The determination was made to include gender as a control variable in these regressions due to the relationship between gender, attention problems, ADHD, and firesetting.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Sex</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention Problems</td>
<td>Female</td>
<td>395</td>
<td>7.73</td>
<td>3.00</td>
<td>.012*</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>579</td>
<td>8.23</td>
<td>3.13</td>
<td></td>
</tr>
<tr>
<td>ADHD</td>
<td>Female</td>
<td>395</td>
<td>6.74</td>
<td>2.59</td>
<td>.302</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>579</td>
<td>6.93</td>
<td>2.75</td>
<td></td>
</tr>
<tr>
<td>Attention Problems</td>
<td>Female</td>
<td>395</td>
<td>7.23</td>
<td>4.50</td>
<td>.000***</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>579</td>
<td>9.45</td>
<td>4.16</td>
<td></td>
</tr>
<tr>
<td>ADHD</td>
<td>Female</td>
<td>395</td>
<td>5.77</td>
<td>3.46</td>
<td>.000***</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>579</td>
<td>7.41</td>
<td>3.35</td>
<td></td>
</tr>
</tbody>
</table>

Note: Factor Analysis sample.
*p ≤ .05; ** p ≤ .01; ***p ≤ .001.
Race was also examined in relation to attention problems and symptoms of ADHD. There was a statistically significant difference in the rating of attention problems by the youth and the parent and also the parent’s report of ADHD symptoms. Caucasian adolescents reported more attention problems than their African American peers, F (2, 842) = 3.58, p < .05. Conversely, parents of African American adolescents reported more attention problems than parents of Caucasian children, F (2, 842) = 6.24, p < .01. They also reported more ADHD symptoms than parents of Caucasian and Other race children, F (2, 842) = 8.09, p < .001. Due to this finding, race was also included as a control variable.

Two logistic regressions were run using the ratings on the Youth Self-Report and Parent rating of Attention Problems to predict the likelihood that a child with more reported attention problems would set fires. Both the child and parent report of attention problems (Attentionraw and AttentionRaw_CBCL) indicate that there is a significant relationship between attention problems and firesetting. (p < .05). Based on the youth’s report, the odds are 8.0% higher of being a firesetter for every one unit increase in the attention problem raw score (see table 9). Based on parental/caregiver reports, a youth’s odds of being a firesetter increase by 7.0% for every one unit increase in the attention problem raw score (see table 10).

### Table 9. Logistic regression for self-reported attention problems and firesetting

<table>
<thead>
<tr>
<th>Predictors</th>
<th>β</th>
<th>SE</th>
<th>Sig.</th>
<th>Exp (β)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>-1.31</td>
<td>0.27</td>
<td>.000</td>
<td>0.27***</td>
</tr>
<tr>
<td>White</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>African American</td>
<td>-0.39</td>
<td>0.34</td>
<td>0.258</td>
<td>0.68</td>
</tr>
<tr>
<td>Other</td>
<td>0.42</td>
<td>0.23</td>
<td>0.075</td>
<td>1.53</td>
</tr>
<tr>
<td>Attention Problems</td>
<td>0.08</td>
<td>0.04</td>
<td>0.034</td>
<td>1.08*</td>
</tr>
</tbody>
</table>

Note: Controls are Gender and Race. Factor Analysis sample. Block 1: Nagelkerke $R^2 = .08; \chi^2(3) = 36.23; p < .001$ Block 2: Nagelkerke $R^2 = .09; \chi^2(4) = 40.73; p < .001; ^* p \leq .05; ^{**} p \leq .01; ^{***} p \leq .001.$

### Table 10. Logistic regression for parent-reported attention problems and firesetting

<table>
<thead>
<tr>
<th>Predictors</th>
<th>β</th>
<th>SE</th>
<th>Sig.</th>
<th>Exp (β)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>-1.23</td>
<td>0.28</td>
<td>.000</td>
<td>0.29***</td>
</tr>
<tr>
<td>White</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>African American</td>
<td>-0.51</td>
<td>0.34</td>
<td>0.136</td>
<td>0.60</td>
</tr>
<tr>
<td>Other</td>
<td>0.37</td>
<td>0.24</td>
<td>0.123</td>
<td>1.44</td>
</tr>
<tr>
<td>Attention Problems</td>
<td>0.07</td>
<td>0.03</td>
<td>0.011</td>
<td>1.07*</td>
</tr>
</tbody>
</table>

Note: Controls are Gender and Race. Factor Analysis Sample. Block 1: Nagelkerke $R^2 = .08; \chi^2(3) = 36.23, p < .001.$ Block 2: Nagelkerke $R^2 = .10; \chi^2(4) = 42.74; p < .001; ^* p \leq .05; ^{**} p \leq .01; ^{***} p \leq .001.$

Two additional logistic regressions were run to investigate whether higher levels of reported ADHD symptoms would predict firesetting. Using the child and parent raw score on the ADHD variable (ADHD_rawscale and CBCLADHD_rawscale), the results indicate that the child’s rating of ADHD symptoms is not significantly predictive of firesetting (see table 11). The parent/caregiver score was, however, significant at the p < .05 level. The odds of a child setting fires increases by 8.0% for every one unit increase in the ADHD raw scale score as reported by the parent (see table 12).
Table 11. Logistic regression for self-reported ADHD symptoms and firesetting

<table>
<thead>
<tr>
<th>Predictors</th>
<th>( \beta )</th>
<th>( SE )</th>
<th>Sig.</th>
<th>( \text{Exp}(\beta) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>-1.34</td>
<td>0.27</td>
<td>.000</td>
<td>0.26***</td>
</tr>
<tr>
<td>White</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>African American</td>
<td>-0.41</td>
<td>0.34</td>
<td>0.228</td>
<td>0.66</td>
</tr>
<tr>
<td>Other</td>
<td>0.41</td>
<td>0.29</td>
<td>0.087</td>
<td>1.50</td>
</tr>
<tr>
<td>ADHD</td>
<td>0.07</td>
<td>0.04</td>
<td>0.104</td>
<td>1.07</td>
</tr>
</tbody>
</table>

Note: Controls are Gender and Race

Factor Analysis sample
Block 1: Nagelkerke \( R^2 = .08; \chi^2(3) = 36.23; p < .001 \)
Block 2: Nagelkerke \( R^2 = .09; \chi^2(4) = 38.85; p < .001 \);
*p \leq 0.05; ** p \leq 0.01; ***p \leq 0.001.

Table 12. Logistic regression for parent-reported ADHD symptoms and firesetting

<table>
<thead>
<tr>
<th>Predictors</th>
<th>( \beta )</th>
<th>( SE )</th>
<th>Sig.</th>
<th>( \text{Exp}(\beta) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>-1.25</td>
<td>0.28</td>
<td>.000</td>
<td>0.29***</td>
</tr>
<tr>
<td>White</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>African American</td>
<td>-0.51</td>
<td>0.34</td>
<td>0.133</td>
<td>0.60</td>
</tr>
<tr>
<td>Other</td>
<td>0.38</td>
<td>0.24</td>
<td>0.108</td>
<td>1.47</td>
</tr>
<tr>
<td>ADHD</td>
<td>0.08</td>
<td>0.03</td>
<td>0.016</td>
<td>1.08*</td>
</tr>
</tbody>
</table>

Note: Controls are Gender and Race

Factor Analysis sample
Block 1: Nagelkerke \( R^2 = .08; \chi^2(3) = 36.23; p < .001 \)
Block 2: Nagelkerke \( R^2 = .10; \chi^2(4) = 41.99; p < .001 \);
*p \leq 0.05; ** p \leq 0.01; ***p \leq 0.001.

Results for the secondary research hypotheses

The National Survey sample dataset was utilized to examine the prevalence and characteristics of juvenile firesetting in a normative sample. As previously explained, the individuals in this dataset are much more diverse than many of the samples used in other research studies on firesetting.

Variables for hypotheses 3 and 4 (National Survey Dataset)

Research questions 3 and 4 investigate the prevalence and characteristics of firesetters in the National Survey dataset, which is a more normative sample. Based on the purpose of these questions, variables were selected which have been investigated in other studies in order to allow comparison.

Firesetting

Firesetting was also utilized as the dependent variable for hypotheses 3 and 4. As expected, the majority of children and parents reported no firesetting in the National Survey, which is a much more normative sample (see table 13). Based on the same rationale discussed previously, the firesetting variable in the YSR data was recoded as 0 (no firesetting) and 1 (firesetting) \( N = 1158 \). Only 53 adolescents reported any firesetting behavior, which is 4.6% of the total sample.

Independent variables

The predictor variables for the secondary research questions also included demographic variables, several scale scores, and a created scale representing academic performance.

Demographics. Demographic information utilized includes age, gender, and race variables. In the
National Survey dataset, 47.6% of the cases were female and 52.5% were male. \((n = 551\text{ and } n = 610,\) respectively). Gender was recoded with 0 (female) and 1 (male). The race variable was again recoded as (Race) with 3 groups; Caucasian, African American and other \((n = 718, n = 227\text{ and } n = 216,\) respectively). The age range of children and adolescents in the National Survey was also 11 to 18 years \((N = 1161, M = 14.11, SD = 2.23)\). The mean age of the girls was 14.12 years and the mean age of the boys was 14.09 (see table 14).

### Table 13. Frequency of adolescents and parents reporting firesetting in National Survey Sample

<table>
<thead>
<tr>
<th>Response</th>
<th>Parent</th>
<th>Adolescent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not True</td>
<td>1146</td>
<td>1105</td>
</tr>
<tr>
<td>Somewhat or Sometimes True</td>
<td>14</td>
<td>47</td>
</tr>
<tr>
<td>Very True or Often True</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

### Table 14. Descriptives for predictor variables in National Survey Sample

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Internalizing Problems</th>
<th>Externalizing Problems</th>
<th>Total Problems</th>
<th>Academic Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(N) Valid</td>
<td>1161</td>
<td>1159</td>
<td>1159</td>
<td>1159</td>
<td>1053</td>
</tr>
<tr>
<td>(N) Missing</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>108</td>
</tr>
<tr>
<td>Mean</td>
<td>14.11</td>
<td>10.48</td>
<td>10.38</td>
<td>3.26</td>
<td>2.23</td>
</tr>
<tr>
<td>(SD)</td>
<td>2.23</td>
<td>62.46</td>
<td>7.49</td>
<td>22.32</td>
<td>0.49</td>
</tr>
</tbody>
</table>

**Internalizing problems.** The Internalizing Problems raw score \((\text{Internal}_{\text{raw}})\) from the YSR and CBCL were examined for use in hypothesis 4. The Internalizing grouping "mainly reflects problems within the self, such as anxiety; depression; somatic complaints without known medical cause; and withdrawal from social contacts” (54, p. 93). It was found that adolescents self-reported higher levels of internalizing problems \((N = 1,159)\). The self-reported mean of Internalizing Problems was 10.48 while parents reported a mean of 6.74. The determination was made to utilize the self-report score as it makes sense that the adolescents themselves are the best judge of their own thoughts and feelings. Reference table 14 for descriptives of this scale.

**Externalizing problems.** The Externalizing Problems raw-score \((\text{External}_{\text{raw}})\) was used for hypothesis 4 as well. The Externalizing Problem scale questions represent “conflicts with other people” and expectations for children’s behavior (54, p. 93). The means of the child and parent reported were examined.

Again, the mean for the self-report score was higher \((M = 10.38)\) than the parent’s report of externalizing behavior \((M = 7.77, N = 1160\text{ for both groups})\). Consideration was given to the nature of the items in this scale and it also appears that the self-report score may provide a better gauge of the child’s behavior. Many of the items refer to behavior that an older child or adolescent would hide from a parent including lying, sexual problems, fighting, drug use, and drinking. See table 14 for descriptives of the adolescent’s rating of Externalizing Problems.

**Total problems.** The Total Problems T-score \((\text{TotalProblems}_{\text{raw}})\) represents the child’s score on all the problem items. This scale score was used for hypothesis 4. The youth self-reported score was utilized. The mean and standard deviation is described in table 14.

**Academic performance.** The same academic performance scale was created using the National Survey data. The Cronbach’s \(\alpha\) for the scale \((\text{AcademicPerformance})\) was .84 \((N = 1053)\). Reference table 14 for descriptive information on this created scale.

Attention problems and ADHD. The Attention Problem scale \((\text{Attention})\) and ADHD scale \((\text{ADHD})\) raw scores were utilized in hypothesis 4. Reference table 15 for descriptives of these four scales.
Procedures to examine the prevalence of firesetting in a normative sample

The National Survey dataset was used to examine the prevalence of firesetting in a large normative sample. Initial frequency analyses were run to identify the self-reported incidence of firesetting in a large, normative sample. After this frequency data was examined, the firesetting item was again recoded to 0 (no firesetting) and 1 (firesetting). Cross-tabs were run to investigate prevalence of firesetting comparing males and females in this sample. A logistic regression analysis was conducted to determine if gender was predictive of firesetting in this sample.

The reported rates of firesetting by each race was also investigated using cross-tabs and logistic regression. The purpose of these analyses was to determine if race is associated with firesetting in a randomly selected sample that includes adolescents from all across the United States and several other countries. Most studies on firesetting include individuals from only one geographic area so this data represented a better opportunity to examine the relationship between these two variables.

Results of analyses examining the prevalence of firesetting in a normative sample

When investigating firesetting utilizing the National Survey dataset (N = 1,161), it was found that a small percentage of the adolescents reported firesetting behavior (see table 16). An even lower number of parents/guardians reported their child set fires. (n = 15). The youth’s report of firesetting was recoded to 0 (no firesetting) and 1 (firesetting) (n = 53).

The main focus of this question was to address whether the same difference in the prevalence of firesetting between boys and girls also existed in larger more representative samples. Crosstabs were run to examine the frequency of firesetting among boys and girls. Boys (n = 568) reported 41 firesetting cases (77.36% of the firesetters) while girls (n = 537) only had 12 individuals who reported setting fires (see table 17). A logistic regression indicated that the predicted odds of a juvenile setting a fire decreased by 69% if the individual is female (odds ratio of .31, p < .001; χ² = 14.53; p<.001; Nagelkerke R² = .04).

An initial cross-tabs analysis was run to determine the number of individuals of each race who reported firesetting. A logistic regression was then run to examine the influence of race on firesetting in this sample. The race variable was again recoded to 1-Caucasian (n = 718), 2-African American (n = 227), and 3-Other (n = 216) from the original six groups. See table 18 for frequency of firesetting by race. The logistic regression indicated no significant difference in the odds of firesetting between races.

Table 15. Descriptives of attention problems and ADHD symptoms

<table>
<thead>
<tr>
<th></th>
<th>Attention Youth</th>
<th>Attention Parent</th>
<th>ADHD Youth</th>
<th>ADHD Parent</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>1159</td>
<td>1160</td>
<td>1159</td>
<td>1160</td>
</tr>
<tr>
<td>Mean</td>
<td>5.12</td>
<td>3.89</td>
<td>4.59</td>
<td>3.19</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>3.30</td>
<td>3.75</td>
<td>2.87</td>
<td>3.00</td>
</tr>
</tbody>
</table>

Note: National Survey sample.

Table 16. Frequency of self-reported firesetting (original coding)

<table>
<thead>
<tr>
<th>Response to “I set Fires”</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not true</td>
<td>1105</td>
<td>95.2</td>
<td>95.4</td>
<td>95.4</td>
</tr>
<tr>
<td>Somewhat or sometimes true</td>
<td>47</td>
<td>4.0</td>
<td>4.1</td>
<td>99.5</td>
</tr>
<tr>
<td>Very true or often true</td>
<td>6</td>
<td>0.5</td>
<td>0.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>1158</td>
<td>99.7</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1161</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: National Survey sample.
### Table 17. Frequency of firesetting by gender in the National Survey Sample

<table>
<thead>
<tr>
<th>Firesetting Reported</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (1)</td>
<td>41</td>
<td>12</td>
</tr>
<tr>
<td>No (0)</td>
<td>568</td>
<td>537</td>
</tr>
</tbody>
</table>

### Table 18. Frequency of firesetting by race in the National Survey Sample

<table>
<thead>
<tr>
<th>Firesetting Reported</th>
<th>Caucasian</th>
<th>African American</th>
<th>Other Race</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (1)</td>
<td>35</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>No (0)</td>
<td>680</td>
<td>222</td>
<td>203</td>
</tr>
</tbody>
</table>

**Procedure to examine the characteristics of firesetters in a normative sample**

The final set of analyses were run to investigate whether known correlates of firesetting would also be related to that behavior in a large normative sample, versus data derived from clinical, inpatient, and outpatient settings.

Initial descriptive information about the parent and child ratings of internalizing, externalizing, and total problems was analyzed to determine which scale scores to include. The academic performance scale (AcademicPerformance) was also created in the National Survey dataset.

Independent samples t-tests were run to examine the group differences between firesetters and non-firesetters on ratings of Internalizing (Internal_raw), Externalizing (External_raw) and Total Problems (TotalProb_raw). Finally, the differences between firesetters and non-firesetters were examined using t-tests for academic performance (AcademicPerformance), attention (Attention_raw), and ADHD symptoms (ADHD_raw). Both adolescent and parent reports were used in the t-test analysis examining attention problems and ADHD symptoms.

**Results of analyses examining the characteristics of firesetters in a normative sample**

Descriptive were run to determine which of the available variables measuring Internalizing, Externalizing, and Total Problems should be used for the regressions. Similar to the firesetting variable, adolescent’s self-reported more internalizing problems than their parents (see table 19). The decision was made to utilize the adolescent’s self-reported ratings of internalizing, externalizing, and total problems for multiple reasons. Primarily, the items on these scales measure behaviors or thoughts that a parent or guardian may not be aware their child is having. Additionally, the difference in frequency on the firesetting item illustrates that parents may be under-reporting these types of issues and the adolescent’s rating may be a more accurate measure of the child’s functioning.

Independent t-tests were conducted to determine if there were significant differences between firesetters and non-firesetters reports of Internalizing, Externalizing, and Total Problems. Significant differences were found in all three areas between the firesetter and non-firesetter groups. The firesetter group reported more Internalizing, Externalizing, and Total Problems than the adolescents who reported no firesetting. The results were statistically significant. See table 20 for results.

Lastly, analyses were conducted to determine if differences exist between firesetters and non-firesetters on reports of academic performance, attention and ADHD symptoms. Independent sample t-tests were conducted comparing firesetters to non-firesetters in the areas of academic performance (Academic Performance), parent and child reported attention (Attention_CBCL and Attention_YSR) and symptoms of ADHD reported by the parent and child.
Juvenile firesetting

(ADHD_CBCL and ADHD_YSR). Statistically significant differences between firesetters and non-firesetters were evident in reported academic performance as measured by grades and both the parent and child’s reports of attention problems and ADHD symptoms (see table 21).

Table 19. Comparison of self-report and parent ratings for problem variables

<table>
<thead>
<tr>
<th>Internal YSR</th>
<th>Internal Parent</th>
<th>External YSR</th>
<th>External Parent</th>
<th>Total YSR</th>
<th>Total Parent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>10.48</td>
<td>6.74</td>
<td>10.38</td>
<td>7.77</td>
<td>37.64</td>
</tr>
<tr>
<td>SD</td>
<td>7.90</td>
<td>6.35</td>
<td>7.49</td>
<td>8.12</td>
<td>22.32</td>
</tr>
<tr>
<td>N</td>
<td>1159</td>
<td>1160</td>
<td>1159</td>
<td>1160</td>
<td>1160</td>
</tr>
</tbody>
</table>

Table 20. Internalizing, externalizing, and total problem means by firesetting group

<table>
<thead>
<tr>
<th>Firesetting</th>
<th>Yes</th>
<th>No</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internalizing Problems</td>
<td>16.66 (10.94)</td>
<td>10.19 (7.61)</td>
<td>-4.26**</td>
<td>54.45</td>
</tr>
<tr>
<td>Externalizing Problems</td>
<td>18.32 (10.56)</td>
<td>10.01 (7.10)</td>
<td>-5.67**</td>
<td>54.28</td>
</tr>
<tr>
<td>Total Problems</td>
<td>60.47 (32.67)</td>
<td>36.59 (21.11)</td>
<td>-5.27**</td>
<td>54.10</td>
</tr>
</tbody>
</table>

Note: Standard Deviations appear in parentheses below means.
National Survey sample.
*p ≤ .05; ** p ≤ .01; ***p ≤ .001.

Table 21. Attention, ADHD and academic performance means by firesetting group

<table>
<thead>
<tr>
<th>Firesetting</th>
<th>Yes</th>
<th>No</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Performance</td>
<td>3.09 (0.66)</td>
<td>3.26 (0.48)</td>
<td>2.50 *</td>
<td>1048</td>
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<tr>
<td>Attention Problems-Youth</td>
<td>7.68 (3.58)</td>
<td>5.01 (3.24)</td>
<td>-5.84***</td>
<td>1154</td>
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<tr>
<td>Attention Problems- Parent</td>
<td>6.43 (4.63)</td>
<td>3.78 (3.67)</td>
<td>-4.11***</td>
<td>55.17</td>
</tr>
<tr>
<td>ADHD Symptoms-Youth</td>
<td>6.34 (3.17)</td>
<td>4.51 (2.82)</td>
<td>-4.58***</td>
<td>1154</td>
</tr>
<tr>
<td>ADHD Symptoms- Parent</td>
<td>4.66 (3.62)</td>
<td>3.12 (3.00)</td>
<td>-3.05**</td>
<td>55.38</td>
</tr>
</tbody>
</table>

Note: Standard Deviations appear in parentheses below means.
*p ≤ .05; ** p ≤ .01; ***p ≤ .001.
Discussion

The purpose of this study was to identify school related predictors of juvenile firesetting and examine the prevalence of firesetting in a large dataset consisting of children from non-clinical settings. Two separate datasets were utilized to address the hypotheses. Firesetting was the dependent variable for all questions and was defined by a self-reported item on the ASEBA Youth Self-Report asking a student to indicate if “I set fires” was never, sometimes, or very true for them. The firesetting variable was recoded into a dichotomous variable due to the nature and severity of fire play and the lack of parameters on defining the difference between the different levels.

The main two research hypotheses focused on academic and attention variables and the first question also incorporated a variable measuring an adolescent’s general attitude toward school. Logistic regressions were run for both questions after initial analyses evaluated the relationship between the dependent variables and firesetting and confirmed their inclusion in the regression models as controls and confounding variables. In the final regression models for each question, gender and race were entered as the first step and then the explanatory variable was entered. Attitude toward school was also utilized in isolation and along with academic performance in a logistic regression on firesetting to determine how much influence academic attitude had on firesetting likelihood.

The final two questions took advantage of the availability of a large normative dataset that include a variable on firesetting. Firesetting served as the dependent variable in all analyses to look at prevalence of firesetting in a non-clinical sample, for both prevalence and gender differences. Independent samples t-tests were conducted to determine if commonly cited characteristics of juvenile firesetters such as internalizing and externalizing problems were also associated with firesetting behavior in this large dataset.

Academic performance and firesetting

One of the main goals of this study was to investigate the relationship between academic performance and firesetting. Only three previous research studies were located that focused specifically on these characteristics and this was identified as a gap in literature and research on firesetting. Children spend the majority of their time in school, yet little was known about academic differences between firesetters and non-firesetters.

Using logistical regression analysis, results indicate that gender and academic performance are significant predictor variables. Although being male increases the likelihood that a child will set a fire by 70% when compared with a female child of the same age and race, it was also found that children and adolescents who report poorer academic performance are more likely to set fires when controlling for gender and race.

Children with failing performance in the four main academic areas are much more likely to set fires than their peers who are academically successful. The results of independent samples t-test using the National Survey sample also found a significant difference in academic performance between firesetters and non-firesetters.

Additional analyses using logistic regression were done using a variable measuring a child’s general attitude toward school. It was found that a child’s attitude toward school is more predictive of firesetting than academic performance. Interestingly, when attitude toward school is entered as a control variable, academic performance is no longer a significant predictor. This final model explained 13.8% of the variance as compared to the initial model using only academic performance (8.6%). These findings generated a new prediction model for predicting firesetting with school related performance and attitude.

Children and adolescents’ perception of their academic performance, truancy, and disobedience at school, along with their performance as measured by grades is predictive of firesetting. Although the assumption cannot be made that a child with both low academic performance and a poor attitude toward school will set fires, it certainly encourages teachers and parents to pay attention to an adolescent who is displaying behavior problems at school, skipping school, and has poor grades.
Juvenile firesetting

Attention problems, ADHD, and firesetting

Using logistic regression analysis, the results indicate that attention problems and ADHD symptoms as reported by the child or parent are predictive of firesetting. Four regressions were run using the parent’s ADHD and Attention scale raw score as well as the adolescent’s ADHD and Attention scale score. The models explained 8.2% to 9.2% of the variance, respectively, with the youth’s self-report serving as a better predictor of firesetting. Children who displayed higher levels of inattention, hyperactivity, and symptoms of ADHD are more likely to set fires. This was found to be true for both the children in the Factor Analysis and National Survey data sets. These findings confirm previous research from clinical settings suggesting hyperactivity and impulsivity play a role in firesetting. Previous research looking at firesetting has included some findings on the relationship between attention and ADHD. It is known that hyperactivity and impulsivity are related to poor decision making. Children with elevated attention problems and ADHD symptoms are more likely to act without thinking or considering consequences. These findings support observations of this author when working with firesetters. Many of the parents report the child is diagnosed with ADHD, and when the child is questioned about why they were playing with fire they state they were “bored” and “didn’t think.” The implications for practice will be discussed later but understanding that children with inattention and hyperactivity are more likely to sets fires links to prevention and intervention strategies.

Prevalence and characteristics of firesetters in a normative sample

A smaller percentage (4.5%) of children in the normative sample reported firesetting than in the sample containing children with elevated levels of problems. Significantly more males than females report setting fires. Gender is highly predictive of firesetting with males being 69 % more likely to set fires than their female peers. This is consistent with other researcher findings in a variety of settings; so, it appears that regardless of the population, gender plays a significant role in a child’s behavior involving fire. Internalizing problems, externalizing problems, and total problems were all associated with firesetting even in a normative sample. Firesetters reported more problems in all these areas as well as academic problems, attention problems, and symptoms of ADHD. In consideration of the findings with the National Survey dataset and their consistency with findings from clinical settings, it is possible that many children who set fires also display enough other problematic behaviors that they end up being referred to a mental health or other professional. This would explain why the results of this study are consistent with those examining samples from clinical settings. The children who set fires in the normative data sample may mirror the types of children who end up being included in samples from clinical settings.

Individual control variables as predictors of firesetting

Variables were selected for inclusion in this study based on the hypotheses and also to address gaps in research. Demographic variables and variables of interest were examined to determine if they were predictive of firesetting outside of the regression models.

Gender. Being a male between the ages of 11 and 18 significantly increased the odds of being a firesetter. Gender was found to be a significant predictor in both datasets.

Age. Age was examined in the factor analysis data set and excluded as an independent variable. The initial logistic regression suggested an association between age and firesetting, although given the age range of the cases and what is known about the correlation between age and firesetting this did not make sense theoretically. The literature on firesetting indicates that age has a relationship to the type of firesetting displayed; however, this is more a reflection of the child’s developmental stage. For example, younger children are more likely to set fires due to curiosity or accidentally while older adolescents may set fires as a display of delinquent behavior. Further examination revealed that the sample consisted of more young boys and older females, thus making it appear that age was a
predictor since more boys set fires and the boys in the sample were younger.

**Race.** Race was not a significant predictor of firesetting. There were no statistically significant differences when analyses were conducted with the Factor Analysis sample or the National Survey sample.

**Strengths of the study**

Several strengths to this study were identified. First, the use of the ASEBA data is strength. The rating forms have established reliability and validity data for the Attention, ADHD, Internalizing, Externalizing, and Total Problems scales. The raw data were collected by the company for normative purposes and therefore allowed access to a large population of individuals. Specifically, the National Survey sample is more representative of the general population than is often used for firesetting research. The composition of the National Survey data set is unique. Children are represented from 40 states and two other countries. This helps negate any effects of cultural or regional differences that may contribute to firesetting and also allows for the findings using the National Survey data to be considered more generalizable. This is an important consideration because one previous study found that children’s involvement with fire is related to culture and exposure to fire use (58).

The self-report format of the data is an additional strength. Parents under-report firesetting and it is this author’s experience that many parents don’t realize their child plays with fire until there is an incident resulting in a burn injury or damage. The use of the adolescent’s self-reported firesetting provided a more accurate estimate of the prevalence of firesetting and also a larger sample size.

One of the goals of this study was to address gaps in the research and this is also a strength. There are few studies on the relationship between a child’s academic performance and firesetting. This relationship was examined by using both the child and parents’ reports of the child’s academic performance as measured by grades and attitude toward school.

Another strength of this study is the focus on adolescents ages 11 to 18 years. Previous research provides less information on firesetters over the age of 12 years due the age of accountability in many states. Much of the previous research on firesetting focuses on younger kids because these children are not involved in the justice system. Younger children are rarely referred to the court system for firesetting and are more likely to end up in an intervention or treatment program and it is these programs and populations that have been used to conduct research on juvenile firesetting outside of a clinical setting. Older children are more likely to be charged with arson and once they enter the justice system less information is available. Fortunately, this database specifically examines the age range from 11 to 18 years old. The results of the analysis with this older age group continue to support the findings from other studies with younger children

**Limitations of the study**

This study had several limitations that should be considered. The composition of the Factor Analysis data set, although more representative of the general population than many firesetting studies, still consists of adolescents with higher levels of reported problems than an “average” child. ASEBA created the Factor Analysis sample by selecting adolescents from the National Survey sample with a Total Problem score that was higher than the mean. Additional cases were pulled from other sources such as mental health centers. Due to this limitation, care should be taken when generalizing the findings from the Factor Analysis sample to other populations.

An additional limitation is the small number of firesetters in the National Survey sample. Small sample sizes and few children in the target group can lead to problems in recognizing if there is a significant difference between the groups and obtaining adequate power. If the sample is too small, it can influence the power and lead to Type II errors or a false negative. In the case of these research hypotheses, a Type II error could lead to declaring that there were no differences between children who set fires and those who do not.

The usage of one item as the measure of firesetting could also be considered a limitation. A child’s interpretation of “I set fires” may not include match play or fire play when items or objects were
Juvenile firesetting

not burned. If the YSR and CBCL consisted of several items to investigate fire interest, fire play and firesetting it is possible that more children would fall into the firesetter group. Additional items such as these would allow more detailed analysis since adolescents could be classified into multiple groups based on the type of firesetting behavior, frequency, or severity. Use of the dichotomous dependent variable (firesetter or non-firesetter) also restricted the type of data analysis that could be performed.

**Implications for practice**

The results of this study help further define risk factors and identify relationships between firesetting, academic functioning, and attention. Identification of these risk factors can help practitioners, teachers, and parents target groups for prevention programs. For example, teachers can easily recognize children who are struggling academically and having attention problems. These children may benefit from prevention programs that teach good decision making and could help prevent firesetting that is related to impulsivity and just “not thinking.” Furthermore, children who are exhibiting a poor attitude toward school such as skipping classes and disobedience should also receive attention.

Findings of this study could lead to development of better fire risk assessments and intervention programs. There are only a few fire risk assessments currently available to fire service personnel who coordinate intervention programs. The results of this study suggest that interviews with teachers and parents, specifically about academic performance, school attitude, externalizing problems, and internalizing problems can provide a wealth of information about the child’s risk level.

As mentioned previously, children who report firesetting also report more total problems than their non-firesetting peers. This finding would suggest a multi-disciplinary approach to intervention and prevention would be beneficial rather than targeting firesetting in isolation. Although a child may initially get attention for firesetting, it is likely that there are additional areas of concern that need to be assessed and addressed. Collaboration between fire service personnel, teachers, school psychologists and mental health practitioners is critical in accomplishing this.

There are also implications of this study for school psychologists using the ASEBA measures for psychoeducational assessments. The firesetting question is only one item on the rating scale; however, it is one that deserves immediate attention when reported. It this author’s experience that this question is not given enough emphasis, even though it is identified as critical item. Typically, school psychologists enter the raw ratings into the ASEBA reporting software and then report the summary of the findings for the child, versus conducting individual item analysis. If the rating scale contained a question “I play with guns” there is no doubt that this item would be a red flag for immediate attention. The consequences of any type of firesetting can be disastrous and deadly, just like a child playing with a loaded firearm. Noticing and addressing a child’s answer to this one question could potentially save lives and prevent property damage.

Many instances of firesetting can be attributed to access to ignition materials, lack of supervision, and opportunity to set a fire. The findings of this study indicate that parents of children with attention, academic, and other externalizing and internalizing problems should be diligent in locking up lighters and providing good supervision. It is this author’s experience that even when children set fires at school, no adults are in the area and the adolescent typically had a lighter in his or her possession. Parents should be encouraged to check backpacks and rooms to ensure they do not have items such as lighters that can be used inappropriately. Parents can also be encouraged to talk to their children about the dangers of playing with fire and possible consequences (injury, death, property damage, and criminal charges) so that an adolescent who is struggling with attention and ADHD may stop and think prior to playing with fire.

**Future research**

This study investigated some of the characteristics of juvenile firesetters, but there are many additional avenues of research possible utilizing these datasets. There are 112 individual items responses and a
multitude of scale scores available for analyses. Research could be conducted to look at the association of the DSM scale scores and firesetting, peer relationships and firesetting, or specific areas of interest such as involvement in organizations and sports and firesetting. This could lead to creation of much more comprehensive prediction models, risk profiles, and assessments.

Treatment studies could also be conducted utilizing the ASEBA measures as pre-and post-treatment ratings of firesetting after intervention programs. Given the prevalence of firesetting in the general population (4.5%) it could be expected that for every 100 kids sampled four to five children will report firesetting. Many schools contain several hundred children with even more in some areas of the country. It would be interesting to assess children using the ASEBA measures, provide a firesetting prevention program, and then re-assess the same students several years later to determine if the program decreased the expected prevalence of firesetting.

Finally, more research needs to be conducted with normative samples to further confirm the characteristics that are common among juvenile firesetters. The ultimate goal of any juvenile firesetting research should be to aid in early identification and prevention. Significant attention has been placed on identifying school shooters and rightly so; however, estimates from the National Fire Protection Association indicate that approximately 3,600 children die in fires each year, with close to 1,200 of these children dying in fires they were responsible for starting. The more research that is conducted with kids who have not been referred for services the better opportunity there will be to prevent needless deaths and injuries by targeting prevention to those adolescents most at-risk.

Conclusion

The purpose of this study was to identify academic and attention characteristics of juvenile firesetters and determine if these were predictive of firesetting in order to address gaps in the existing research. Additionally, due to the availability of a large normative dataset, the study was also designed to examine the prevalence of firesetting and whether characteristics known to be associated with firesetting in clinical samples are also related when looking at a more generalized population of children.

The findings of this study serve to support and enhance existing knowledge about juvenile firesetting. It is concluded that academic problems and poor school attitude were predictive of firesetting and increased the odds of child or adolescent setting fires. Analysis of the relationship between gender and firesetting confirmed that boys were much more likely to set fires than their female peers.

Analysis of the National Survey sample confirmed that firesetting is a low prevalence behavior, predominantly displayed by boys and associated with internalizing and externalizing behavior problems. The odds of being a firesetter increased when a child reported more problems in these areas as well as lower academic performance, a poor attitude to school and attention problems.

Firesetting is a very dangerous behavior that results in the loss of lives every year. Any research that can contribute to understanding of the characteristics of juvenile firesetters and aid in identification, prevention, and intervention is important in reducing the loss of life and incidence of this behavior. The focus was placed on academic and attention variables because children spend the majority of time at school where teachers and school psychologists can easily identify problems related to school functioning that are predictive of firesetting. Additionally, many fire service professionals work with children who have set fires and although they may not have access to mental health records they can coordinate with parents and teachers to gather information about academic and attention risk factors to help better assess the adolescent’s risk level and design intervention. It is our hope that the findings of this study will assist practitioners in the schools and fire service in providing better services and also encourage other researchers to study the problem as well.

Acknowledgment

Carrie Bowling would like to acknowledge those individuals who supported me personally and
professionally and also believed in the importance of this research. My deep gratitude is extended to Dr. Harley, Dr. Reese, Dr. Danner and Dr. Prout, faculty at the University of Kentucky, who played a crucial role in the completion of this research. They were open-minded and encouraged my study of juvenile firesetting rather than traditional areas of school psychology research. Additionally, they invested their time and expertise throughout the process. I would also like to thank Dr. Homer White, at Georgetown College. Dr. White is a gifted instructor who helped me develop an excitement for statistical analysis and an ability to critically examine the findings. Special thanks are extended to Dr. Omar for recognizing and appreciating the importance of conducting research on juvenile firesetting and also supporting our local intervention program. His professional support has been crucial in both this research and also helping families whose children engage in this dangerous behavior. Last but not least, I am forever grateful to my family and husband for their emotional support and unwavering encouragement.

References


