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Not the Sum of its Parts: A Critical Review of the Macdonald Triad

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Abstract

The Macdonald triad posits that animal cruelty, firesetting, and bedwetting in childhood is indicative of later aggressive and violent behavior in adults. Researchers refer to this phenomenon as a precursor to later antisocial behaviors, including serial and sexual murder; while practitioners cite the triad in clinical formulations and risk assessments. However, there is yet to be a critical review and consolidation of the literature that establishes whether there is empirical support. This article explores the validity of the triad. We conducted a narrative review of the relevant studies examining the Macdonald triad and its individual constituents. There is evidence that any one of the triad behaviors could predict future violent offending, but it is very rare to find all three behaviors together as predictors. Thus, the empirical research on the Macdonald triad does not fully substantiate its premise. Rather, it would appear that the triad, or its individual constituents, is better used as an indicator of dysfunctional home environments, or poor coping skills in children. Future research is needed with robust and rigorous methodologies (e.g., adequate control groups, longitudinal designs) to fully establish the Macdonald triad's validity. Finally, further consideration is needed as to whether the triad behaviors are more indicative of other problematic outcomes (e.g., maladaptive coping to life stressors).

Keywords: Macdonald Triad, Animal Cruelty, Firesetting, Enuresis, Violence

Not the Sum of its Parts: A Critical Review of the Macdonald Triad

The term Macdonald triad, or Homicidal triad, was first coined by John Macdonald (1963) to refer to the presence of three behaviors in childhood as an indicator of later aggressive behavior. In his article entitled 'The Threat to Kill', Macdonald observed three coincidental behaviors which were unique to his most aggressive and sadistic patients. The article was based on 100 patients from the Colorado Psychopathic Hospital in the United States, who had reportedly threatened to kill someone. Based on this, Macdonald identified that (1) bedwetting past the age of five, (2) animal cruelty, and (3) firesetting in childhood should all be interpreted as warning signs for later aggression. According to the theory, the three behaviors when occurring together or as a combination of two or more, indicate that a child is at risk of becoming a violent adult. Despite the initial utility of the triad – to identify most at-risk individuals for violence – the triad was further linked to specific types of violent offenders, including sexual sadists, firesetters, and the most prevalent, serial murderers (Ressler, Burgess, & Douglas, 1988). The clinical importance of the triad is reflected in its continued use by practitioners in a variety of settings (Barrow, Rufo, & Arambula, 2014), but it still remains unclear whether there is adequate empirical support for its validity.

The purpose of this paper is to provide a critical review of the conceptual and empirical literature on the link between the triad behaviors and later aggressive and violent behavior. This paper does not, however, intend to be exhaustive, rather, we focus on providing an overview of the contemporary literature used to explain the links (or lack thereof). This paper also offers an accessible aide-mémoire on the clinical utility of the Macdonald triad given its continued and prevailing use by psychiatrists and other clinical practitioners. Thus, in our review we present the following: (1) Macdonald triad behavior definitions and theories; (2) a critical evaluation of the evidence; and (3) the implications for

using the Macdonald triad in forensic clinical practice for case formulations and care planning in light of the literature reviewed.

The Triad Behaviors: Definition and Theory

Enuresis

The first of the three behaviors, bedwetting, or enuresis, refers to “unintentional bedwetting during sleep, persistent after the age of five” (Hickey, 2010, p.101), and occurring at least twice a week. It affects approximately 15-22% of boys and 7-15% of girls aged seven (Butler, Golding, & Northstone, 2005), and reduces to approximately 1-2% during teenage years (Verhulst et al., 1985). The theoretical basis for the association between enuresis and antisocial tendencies stems from Freud’s proposition that urination was erotic and that bedwetting was a frustrated sexual act (Freud, 1915). More recently, researchers have been skeptical of such claims. Instead, it has been proposed that enuresis is most likely to be caused by medical conditions, such as a tendency to sleep deeply, or an overproduction of urine at night (Joinson, Heron, Emond, & Butler, 2007). Furthermore, the actual effect enuresis has on children is likely to be minimal. There are some studies which suggest enuresis can have a negative impact on children’s self-esteem (Collier et al., 2002; Joinson, Heron, Ermond, & Butler, 2007; Kanaheswari, Poulsaeman, & Chandran, 2012) and that there are treatment gains if the appropriate interventions are implemented (Longstaffe, Moffatt, & Whalen, 2000). However, there are many more studies against such claims and they argue that children who wet the bed are no more likely to experience depression, anxiety or antisocial tendencies, than those who do not (e.g., Shreeham, He, Kalaydjian, Brothers, & Merikangas, 2009; Wille & Anveden, 1995), yielding overwhelming support against using the presence of enuresis as a predictive factor for antisocial behavior and poor mental health outcomes. Another theoretical point that often gets raised is whether the psychological implications of enuresis are the cause or consequence of the behavior, as it is equally likely

that the distress caused by negative parental responses to enuresis may contribute to the development of the aforementioned implications. Such a theory is supported when one considers the evidence to suggest that children who are treated for enuresis experience vast improvements in their self-esteem (Longstaffe, Moffatt, & Whalen, 2000). Whilst it is important to acknowledge that enuresis has been associated with a decreased IQ, research indicates that it is more likely to be the result of maturational deficits of the central nervous system (Joinson et al., 2007b). Thus supporting the notion that childhood bedwetting is physiological, rather than the consequence of a psychological deficit, resulting in later antisocial behaviors.

Animal Cruelty

Macdonald also argued that animal cruelty – which refers to “all socially unacceptable behavior that intentionally causes unnecessary pain, suffering, distress, and/or death to an animal” (Ascione, 1993, p. 83) – was one of the triad behaviors that had developmental sequelae in the form of human-directed aggression. In contrast to enuresis, the theoretical foundations for the association between animal cruelty in childhood and later acts of violence towards others are far better established in the literature. It is widely accepted that children who go on to abuse animals have either witnessed or experienced some form of abuse themselves. For example, studies have shown that children exposed to domestic violence are significantly more likely to have been cruel to animals than children not exposed to such violence (Currie, 2006; DeGue & DiLillo, 2009). As a result of this, it has been recommended that professionals from child and animal welfare organizations work together so that they are able to gain a better understanding of how these issues can co-exist (Hackett & Uprichard, 2007).

Whilst the exact motivations for animal cruelty have not been as well researched, a number of developmental explanations have been suggested, such as curiosity or exploration,

peer pressure, imitation and rehearsal for interpersonal violence (Ascione, Thompson & Black, 1997). Kellert and Felthous (1985) also proposed nine specific motivations from interviews with 152 criminals and non-criminals on their perpetration of animal cruelty. These include: (1) to control an animal; (2) to retaliate against an animal for something it did (e.g. scratched the child); (3) to satisfy a prejudice against a species or breed (e.g. killing all snakes, rats, bugs, cats available); (4) to express aggression through the animal (teaching the animal to be aggressive and attack other humans and animals); (5) to enhance one's own aggressiveness (to hone violent skills); (6) to shock people for amusement (“jokes”); (7) to retaliate against another person (by abusing her/his pet or leaving them a carcass); (8) displacement of hostility from a person to an animal (venting aggression against an easy target when the real target cannot be attacked); (9) nonspecific sadism (pleasure in or obsession with death and pain).

This time utilizing a child sample, Ascione et al. (1977) identified a further 11 motivations for animal cruelty, including peer pressure, mood enhancement, curiosity/exploration, forced abuse, sexual gratification, attachment to an animal, animal phobias, identification with the child's abuser, posttraumatic play, imitation, vehicle for emotional abuse, self-injury, and rehearsal for interpersonal violence. Based on both these findings, Ascione (2001) went on to establish a typology of children and adolescents who are cruel to animals. According to Ascione, there are three types of children/adolescents who are cruel to animals. The first type includes preschool or early elementary-aged children, who have inadequate supervision and are inexperienced with animal care. This type of abuse is often exploratory in nature or committed out of curiosity. The second type of abuser includes children slightly older than pre-school or early-elementary children, who have histories of physical/sexual abuse and/or exposure to domestic violence. This is considered as pathological abuse, and is indicative of psychological disorders. The final type of abuser

proposed by Ascione et al. (1977) takes into account the effects and influence of drugs and/or alcohol on the adolescents during the perpetration of the animal abuse. Within this type it is argued that there is a more general antisociality that is indicative of a multifaceted repertoire of delinquent behavior. As such, this is considered as delinquent abuse, and those under this category are often in need of clinical treatment within the framework of the Criminal Justice System given their extensive criminal histories.

Further developmental theories suggest that childhood animal abuse, or merely witnessing animal abuse as a child, leads to antisocial tendencies as an adult (Thompson & Gullone, 2006; Wright & Hensley, 2003). This may be due to the psychological characteristics that both animal abusers and individuals with violent tendencies appear to share (Ascione, 2005). For example, Howells, Watt, Hall and Baldwin (1997) found that both animal cruelty and interpersonal aggression are caused by heightened levels of intrapersonal aggression and poor anger regulation. Callousness has repeatedly been highlighted as characteristic of both interpersonal aggression and animal cruelty, as well as a compromised ability to experience feelings of empathy (Gupta, 2008; McPhedran, 2009). Subsequent research using retrospective interviews on prison samples have found similar motivations to those listed above including, out of anger, revenge against someone, and imitation (Hensley & Tallichet, 2005). Thus, the developmental link between animal abuse during childhood and violence perpetration during adulthood, coincides with the development of general offence-supportive attitudes and beliefs. Despite offering some insight into the psychological characteristics linked with animal abuse and the theorized sequelae, the developmental theories remain somewhat limited in scope and body of evidence.

As a result of the theorized and somewhat tested developmental link between animal cruelty and violence, animal cruelty has been proposed to have diagnostic utility in clinical practice. Childhood animal cruelty has been identified as a diagnostic criterion of conduct

disorder, alongside firesetting behavior (American Psychological Association, 2013). In order to be diagnosed, a child will have to demonstrate at least three of the associated symptoms over the past year, which are encompassed in the following categories: aggression to people and animals, destruction of property, deceitfulness of theft, and serious violation of rules. Continuation of this disorder into adulthood has been found to be indicative of antisocial personality disorder (Loeber et al., 2002; Simonoff et al., 2004), which is characterized by irresponsible, exploitative behavior, recklessness, impulsivity and deceitfulness (Livesley, 2007). From this it is evident that there is an unsubstantiated presumption that animal cruelty leads to later violence (over and above a bidirectional correlational relationship) which is influencing the assessment, diagnosis, and treatment of personality disorders.

Firesetting

Finally, firesetting – defined as all deliberate acts of setting fires that may or may not have resulted in an official conviction for arson (Gannon & Pina, 2010) – was proposed to be predictive of later violence in conjunction with the above two behaviors. It is relatively common in children, and the consequences of firesetting are devastating, including financial costs, physical and emotional injuries and fatalities. In England, it is estimated that the total cost of arson to the economy in 2008 reached £1.7 billion (Department for Communities and Local Government, 2011). Similar trends can be found in the United States, where an estimated 261,330 incidents were reported each year between 2010 and 2014, resulting in a cost of \$1 billion to the economy in direct property damages alone (National Fire Protection Association, 2014). It has been proposed that children set fires as a response mechanism to both internal and external stressors. They often present with difficulties in problem solving and suffer with pro-social skill deficits (Gannon, Ó Ciardha, Doley, & Alleyne, 2012). According to Singer and Hensley (2004), firesetting represents a release of aggression for a child. Prolonged humiliation has been found to be present throughout the childhoods of

numerous violent adults. In turn, these incidents of humiliation provoke feelings of frustration and anger, which are then released through firesetting to re-establish a degree of self-worth. Whilst this theory of childhood firesetting does well to explain why children participate in this behavior, it does not fully explain why this behavior is predictive of later violence.

Further theoretical explanations have been proposed including social learning theory (SLT). SLT has been used to explain recurrent firesetting and its link with other types of offending. Generally speaking, SLT focuses on learning which occurs within a social context, through principles such as reinforcement, modelling, and imitation. Based on these social learning principles, it has been suggested that firesetting can be a result of positive exposure to fire (i.e. sensory stimulation, firefighter relative; Gannon & Pina, 2010). More specifically, it has been proposed that the sensory excitement, the sirens, the crowds which consequently gather, and the noise associated with fires all act as reinforcers for firesetting behavior (Vreeland & Levin, 1980). In terms of motivational explanations, SLT has been used to explain firesetting driven by revenge or as a result of displaced aggression. Social learning impacts how an individual regulates their responses, therefore poor social skills development as a child may result in aggression, poor coping mechanisms and low assertiveness (Baumeister & Vohs, 2004). Theoretically speaking, all these factors may feed in to an individual being more prone to set fires as a way to regain control of their own environment (Vreeland & Levin, 1980) but they also explain how an individual develops violent tendencies. Furthermore, it has been recognized that the consequences of firesetting can also maintain the behavior, due to the accompanying reinforcement (i.e., sensory stimulation, attention from caregiver), and/or worsening of the original antecedents (i.e., further rejection, punishment; Jackson, Glass, & Hope, 1987).

Firesetting has also been identified as characteristic of children who suffer from conduct disorder, which has been associated with elevated antisociality in adulthood due to

its ties with antisocial personality disorder (Heath, Hardesty, Goldfine, & Walker, 1985; MacKay et al., 2006; Sakheim & Osborn, 1999). Despite firesetting and conduct disorder being correlated, conduct disorder is so diverse that it cannot be used as a justification for firesetting alone. Kolko and Kazdin (1991) carried out a large study and found that firesetters compared to non-firesetters varied on a number of fire-related traits such as curiosity about fire, involvement in fire-related activities and knowledge about things that burn. However, the differences exhibited between these two groups could not be attributed to conduct disorder, as many children without this diagnosis also exhibited firesetting behavior. Theoretically speaking, all these factors may feed in to an individual being more prone to set fires as a way to regain control of their own environment (Vreeland & Levin, 1980) but they also explain how an individual develops violent tendencies.

The Macdonald Triad: Evaluating the Evidence

Before reviewing the literature to identify whether or not existing historical and contemporary research substantiates the Macdonald Triad, it is important to review the original study from which this phenomenon emerged. In his paper 'A Threat to Kill', Macdonald (1963) carried out interviews and clinical observations on 48 psychotic patients and compared them with 52 non-psychotic patients who have made threats to kill another person. In this study, over half of the sample was male and aged between 11 and 83 years. Using chi-square analysis, he concluded that the triad was a prognostic indicator for patients who had threatened to kill another person. Further analysis also revealed that the presence of any of the three triad behaviors was significantly related to the presence of another. However, there are two major limitations to Macdonald's study. First, even Macdonald acknowledged that the small sample size minimized the predictive strength of his findings. The findings are based on a small and unrepresentative sample, thus limiting the generalizability of its conclusions. Second, Macdonald only examined the triad in a sample of patients who had

threatened to kill someone, but the threats were not necessarily acted upon. Therefore, it is possible that people who threaten to kill others differ markedly from those who go on to commit such violent acts (Quinsey, Jones, Book, & Barr, 2006). In light of these limitations, researchers followed up on Macdonald's findings by conducting further studies to determine whether they could establish more robust empirical evidence for the triad.

To date, numerous studies have attempted to examine the Macdonald triad with varied demographic and offending groups, for example prison samples, psychiatric samples, men, women and children. For the purpose of this paper, we only highlight key studies that explicitly (in theory and design) focus on evaluating the predictive validity of the Macdonald triad. The first study to identify a link between the three characteristic behaviors and violence in adulthood was conducted by Hellman and Blackman (1966). In this study, 84 patients from an acute psychiatric unit in the USA were interviewed. The sample was divided into two groups: (1) patients identified as aggressive, and (2) non-aggressive patients. Thirty-one of the 84 patients had been charged with a violent or aggressive crime, of which 75% ($n = 23$) had indicated engaging in the triad behaviors during childhood. In the non-aggressive sample of 53 patients (i.e., individuals who had not been charged/convicted of a violent crime), only 28% ($n = 15$) demonstrated all or some of the triad behaviors. Despite being one of the first articles to produce support for the triad, the findings are not representative due to the nature of the study sample. The authors recruited an all-male sample of psychiatric patients from a forensic mental health unit who were being treated for clinical symptoms and diagnoses. Nonetheless, this study presented a clearly articulated methodology that enables comparative research.

Wax and Haddox (1973) also found support for the Macdonald triad in a small sample of adolescents. A total of 46 young people were referred to the study from the California Youth Authority. Of these, only six participants had a documented history of all three

behaviors: repeat firesetting, persistent enuresis, and animal cruelty. On examining participants' previous criminal behaviors, they found that all six cases had an extensive history of physical and sexual violence. Further, the majority of participants reported experiences of unstable home environments and displayed deficits in their psychological development. Based on this, the authors concluded that the triad was a useful tool in the prediction of violent behavior, but only because it was a good indicator of poor impulse control more broadly. It is also important to note that only six of the 46 delinquent subjects initially referred for this study engaged in all three behaviors of the triad. Therefore, it is possible that there are other indicators in addition to the triad which may better indicate violent or antisocial behavior in adolescents. Moreover, the participants were not observed alongside any control or comparison groups, which further limits these findings.

Whilst these findings lend some tentative support for the triad, later attempts to replicate such findings were not as successful. In 1967, Macdonald reported in his book 'Homicidal Threats', that he could not find any statistically significant association between homicide perpetrators and childhood experiences of firesetting, bedwetting or animal cruelty. Following this, a number of researchers also published findings which contradict the triad's predictive link to future violence. One such study examined the predictive value of the triad in a sample of 206 sexual offenders enrolled on sex offender treatment programs in Massachusetts, USA (Prentky & Carter, 1984). The authors found no compelling evidence to support the predictive value of the triad of behaviors for predicting adult violence. However, the authors did find a notable association between one or more of the components of the triad and a highly maladaptive, unstable home environment. Based on this, it was suggested that the triad was more likely to be children's coping responses to home stressors, such as abusive experiences throughout childhood.

Despite this, it has been highlighted that the frequency of triad behaviors evident within this sample was much lower than what has been previously reported in the literature. For example, in Hellman and Blackman's (1966) original study, they found the full triad to be present in 25% of their sample. Wax and Haddox (1974) also reported that 13% of their sample demonstrated behaviors consistent with the triad. In contrast, Prentky and Carter (1984) only found the full triad to be present in four of the cases examined, contributing to 2% of the total sample. Based on this, if there were any predictive value in the triad, the power achieved by the current sample size would not have been sufficient to draw any firm conclusions.

Furthermore, subsequent studies have reported that the triad behaviors, firesetting, enuresis and animal cruelty, are uncorrelated with each other. Felthous and Yudowitz (1977) interviewed 31 female prisoners and categorized them into two groups depending on their criminal history: assaultive and non-assaultive. On comparing the two groups of females on various criminogenic factors, including childhood firesetting, enuresis and animal cruelty, the authors found no significant differences between the two groups, nor did the behaviors correlate.

These findings have been replicated by Heath, Hardesty and Goldfine (1984), who compared 204 children who exhibited the triad on a number of variables and clinical measures of adjustment. Using the Child Behaviour Checklist (CBCL; Achenback, 1991), the children aged between 4 and 16 years, were classified as animal abusers, firesetters or bedwetters. They found partial relationships between the triad behaviors, with enuresis and animal cruelty being related to only a small proportion of the total firesetters. Furthermore, bedwetting was significantly associated with firesetting without cruelty to animals, and cruelty to animals was significantly associated with firesetting without bedwetting. Based on this, they concluded that situational and environmental factors are likely to play a greater role

in predicting future violence than the presence of the behaviors alone. However, a potential limitation of this study includes the use of parental reports. Parents or caregivers will often deny or not be aware of certain behaviors their child may carry out, thus underestimating the prevalence of animal cruelty, firesetting and bedwetting.

Indeed, additional studies have found that alternative behaviors when present in childhood are indicative of later violence towards others. Justice, Justice and Kraft (1974) carried out a systematic review of the literature at the time and examined 188 references to predictors of violent adult behavior. They found that only 1% involved firesetting, 5% encompassed animal cruelty, and 13% comprised of bedwetting. The most common childhood behaviors referred to in the literature, in regards to violence as an adult, were fighting ($n = 83$) and temper tantrums ($n = 50$). Additionally, Justice et al. interviewed 264 mental health professionals in order to identify predictive symptoms of adulthood violence. Only 1% of the professionals recognized firesetting, 4% recognized animal cruelty and less than 1% recognized bedwetting, as indicative of later violence as an adult.

Despite providing contrasting evidence for the Macdonald triad, Justice et al.'s (1974) study is not without its limitations. Firstly, the systematic review encompassed literature from psychiatry, medicine, psychology, sociology and criminology that was published between 1950 and 1971. However, it is important to note that much of our current understanding of childhood animal cruelty has stemmed from literature published over the past few decades. Secondly, Justice et al. interviewed a total of 779 people from 25 professions. Whilst this is a large number of professionals from a variety of fields, animal abuse is rarely assessed for by clinicians. As a result of this, it is possible that the prevalence of animal cruelty is largely underestimated and, consequently, not adequately accounted for in research and practice.

More recently, Slavkin (2001) examined animal cruelty and enuresis in juvenile firesetters, to identify whether those behaviors were associated with recurrent firesetting. The

case files of 888 adolescents between the ages of 3 and 18 who had been referred to an arson intervention program were reviewed. Slavkin found that whilst the presence of enuresis was unrelated to firesetting, animal cruelty was associated with recurrent firesetting behavior. Rather than predicting adult violence, Slavkin argued that animal cruelty was merely a portion of a set of delinquent behaviors. However, no further data on family and other contextual variables were collected for this study. This would help us to better understand the factors which contribute to firesetting and animal cruelty in childhood, rather than the correlations of the antisocial behaviors in isolation.

As previously touched upon, firesetting and animal cruelty when present in children are indicative of conduct disorder, which is predictive of later antisociality in adults in the form of antisocial personality disorder. Whilst research surrounding this topic does not directly assess the triad, research into conduct disorder is important to consider as it examines the usefulness of at least two of the three traits of interest. For instance, it has been reported that animal cruelty, above firesetting and other possible symptoms, is often one of the first recognizable symptoms of conduct disorder in children, with parents reporting the onset of such behavior at a median age of 6.5 years (Frick, et al., 1993; Spitzer, Davies, & Barkley, 1990). This study highlights the value of considering animal cruelty as an early indicator of conduct disorder in childhood, and consequently antisociality in adulthood. However, firesetting is still an important trait to consider, given that the most common diagnoses associated with firesetting is conduct disorder and/or antisocial personality disorder (American, Psychiatric Association, 2013; Kolko & Kazdin, 1991; MacKay et al., 2006; Martin, Bergen, Richardson, Roeger, & Allison, 2004). Whilst both traits bare a degree of importance, it should be noted that a diagnosis of conduct disorder in childhood does not guarantee a diagnosis of antisocial personality disorder in adulthood. Thus, the usefulness of

this research with regards to how well it can explain the link between the triad behaviors and antisociality as an adult is limited.

Although there are a number of studies exclusively examining the Macdonald Triad's ability to predict adult violence, the majority of such studies are limited in design with mixed and conflicting findings. While they do utilize a variety of samples including psychiatric patients, adolescents, sexual offenders and female prisoners, the sample sizes are often limited and unrepresentative of the general population. In contrast with claims that the presence of the triad is indicative of later violence, evidence is more favorable towards the triad being a maladaptive response to home stressors. Alternatively, some have argued that situational and environmental factors are more likely to play a moderating role in future violence than the presence of the triad.

Individual Predictors of Violence: Evaluating the Evidence

So far the literature reviewed has encompassed all three behaviors characteristic of the Macdonald triad. It is apparent that there are a number of discrepancies within the literature investigating the validity of the triad's ability to predict adult violence. Not to discount the literature reviewed so far, but psychiatric/psychological services and research methods have developed greatly since the 1990's. However, there are very few recent studies which address all three elements of the triad and their association with later violence. Due to such contradictory findings, research has moved more towards the predictive validity of the triad behaviors in isolation. Thus, from this point onwards, we examine each of the behaviors in tandem while evaluating the evidence for and/or against the link with aggressive and violent behavior during adulthood.

Enuresis as a Predictor of Violence

The link between enuresis and psychological maladjustment, later violence, or any other element of the triad has little to no empirical support (Heath et al., 1984; Heller et al.,

1984; Slavkin, 2001). More so, it is not entirely clear whether it is even associated with sociopathic behavior or distress (Weatherby, Buller, & McGinnis, 2009). Despite this, there are some researchers which continue to claim that enuresis is associated with the remaining behaviors of the triad, animal cruelty and firesetting. Singer and Hensley (2004) argue that children experience humiliation as a result of bedwetting, especially if parental reactions to such incidents are negative. So, children express their frustration via antisocial behaviors such as firesetting or animal abuse.

More recent studies have also challenged the relationship between enuresis and the remaining characteristics of the triad (Glancy, Spiers, Pitt, & Dvoskin, 2003; Slavkin, 2001; Stadolnik, 2000). In a recent study of 8,000 school children, results showed that enuresis, rather, is predominantly linked to emotional stress (Sureshkumar et al., 2009). In most cases, these authors cite poorly designed methodologies as the main reason for a lack of statistical validity in the previous studies. Further concerns surrounding the validity of these studies come from the varying definitions of diurnal and nocturnal enuresis (Bennett & Koval, 2011); whereby diurnal enuresis is daytime bedwetting, and nocturnal is night time bedwetting. As a result of this, there are a number of discrepancies which occur between the definition of enuresis used for the study, and the actual assessment of enuresis during data collection. The importance of making this distinction is highlighted when taking into account the significant overlap between nocturnal enuresis and attention deficit hyperactivity disorder (Sheerham et al., 2009), which is known to increase the risk of adolescent firesetting (Pollinger, Samuels, & Stadolnik, 2005). Overall, bedwetting is neither violent nor voluntary, therefore “linking it to violent crime is more problematic than doing so with animal cruelty or firesetting” (Hickey, 2010, pp.101).

Animal Cruelty as a Predictor of Violence

Since the introduction of the Macdonald Triad, researchers have continued to examine the relationship between childhood animal cruelty and later acts of violence using various methodological and sampling strategies (Arluke, Levin, Luke, & Ascione, 1999; Merz-Perez & Heide, & Silverman, 2001; Tallichet & Hensley, 2004; Wright & Hensley, 2003). However, results of such studies have largely been inconclusive. While some studies have found little to no support for the association between childhood animal cruelty and adult-perpetrated violence, other studies adopting prospective or longitudinal designs have found some support for this predictive/causal relationship (Arluke et al., 1999; Flynn, 1999; Hensley, Tallichet, & Dutkiewicz, 2009; Merz-Perez et al., 2001; Ressler et al., 1998; Tallichet & Hensley, 2004; Verlinden, 2000; Wright & Hensley, 2003). Arluke et al. (1999) examined the case files of 153 animal abusers and 153 controls, and found that animal abusers were more likely than controls to engage in interpersonal violence, property and drug crime. Such findings indicate that whilst childhood animal cruelty is related to interpersonal violence, it is also associated with a variety of antisocial behaviors. However, despite analyzing official criminal records to examine the link between childhood animal abuse and adulthood violence, participants' criminal records were not available prior to the age of 17 years. Therefore, it is not clear whether violent behavior preceded animal abuse or vice versa.

Theoreticians have conceptualized this aforementioned developmental link as the violence graduation hypothesis – described previously as the predictive link between childhood animal abuse and later antisocial behaviors – and there has been some empirical support for this relationship (Thompson & Gullone, 2006; Wright & Hensley, 2003). Wright and Hensley (2003) examined the cases of 354 serial murderers, and found that 75 cases (21%) involved a suspect with a history of childhood animal cruelty. Prior to this, Verlinden (2001) examined childhood animal cruelty in perpetrators of school shootings, and found that nine incidents involved a suspect with a history of childhood animal cruelty. Such findings

are reflected in just the endorsement of interpersonal violence and childhood animal cruelty. For example, Flynn (1999) measured the association between childhood animal cruelty and the endorsement of violence, in particular against women and children, in a sample of 267 undergraduate students. Results showed that 17.6% of participants had engaged in at least one act of animal cruelty, with approximately 16.6% reporting hurting or killing an animal during childhood.

Merez-Perez and Heide (2001) also conducted interviews with 45 violent and 45 non-violent offenders, and found that 56% of violent offenders reported engaging in childhood animal cruelty, compared to 20% of non-violent offenders. Violent offenders were also more likely than non-violent offenders to engage in the abuse alone, and overall expressed less remorse over their behaviors. Tallichet and Hensley (2004) were also interested in the association between repeated acts of childhood animal cruelty and later interpersonal violence. They recruited 261 offenders and analyzed a variety of demographic characteristics. However, findings indicated that only recurrent childhood animal cruelty and total number of siblings were indicative of later interpersonal violence.

Taken together, previous research would suggest that engaging in animal cruelty as a child could possibly lead to later violence directed towards humans. However, it is important to consider that not every child who is cruel to animals go on to aggress against other people. Several studies have actually found that animal cruelty in childhood predicts aggressive crime just as well as nonaggressive crime, which is not completely synchronized with the main premise of the graduation hypothesis (e.g., Arluke et al., 1999; Lucia & Killias, 2011). Walters (2013) recently carried out a comprehensive meta-analysis of 19 studies and concluded that whilst childhood animal cruelty is associated with later antisocial behaviors, it is not isolated to violent offending. Overall, the author found that both violent and non-violent offending were equally correlated with childhood animal cruelty. Such findings offer

support for an alternative explanation of the link between childhood animal cruelty and later antisocial behaviors, in the form of the deviance generalization hypothesis (Arluke et al., 1999; Ascione, 2001; Walters 2013). According to this hypothesis, animal cruelty is just a single component of a larger construct of deviance. In comparison to the violence graduation hypothesis, this view does not assume that animal cruelty precedes human-directed violence, nor does it assume that it leads only to violent offending. Instead, it would appear that it is more likely that animal cruelty is an indicator for future offending behavior, non-violent as well as violent.

Overall, there seems to be several reasons as to why the discrepancies in findings exist in the animal cruelty literature. Firstly, the definition of animal cruelty is not clearly defined in the majority of studies (Lockwood & Ascione, 1998). It has been suggested that studies which were unable to substantiate a relationship between animal abuse and later violence used a definition that was too broad, which therefore normalizes the behavior. Furthermore, cultural factors may also impact individual perceptions of what is considered cruel and non-cruel practices involving animals (Ascione, Kaufmann, & Brooks, 2000). Secondly, the majority of studies have adopted a retrospective approach, which requires participants to recall childhood experiences with animals (Lockwood & Ascione, 1998). This method is highly susceptible to socially desirable responding, affecting disclosure of the severity of such behavior. Finally, childhood animal cruelty literature, as well as firesetting, relies heavily on parental reports. Whilst there are few alternatives, this method can lead to underestimates of the prevalence of such behavior as it may be carried out in secret, away from the home, and away from parental awareness. Despite these limitations, the literature seems to offer at least some support for the relationship between animal cruelty in childhood and antisocial behavior at a later stage (Felthous & Kellert, 1987).

Firesetting as a Predictor of Violence

The final characteristic of the triad to be examined individually is firesetting. The literature on firesetting, much like animal cruelty, suggests that rather than being a predictor of adult violence, firesetting and violent behavior are more likely to co-occur. A Canadian study examining sex offenders found that animal cruelty and firesetting in childhood were more commonly found in sexual murderers, than in other types of sexual offenders (Langevin, 2003). However, Lambie et al., (2013) assessed post-intervention firesetting and other offending behaviors in a sample of 182 child and adolescent firesetters over a 10-year follow-up period. The authors' found that whilst firesetting recidivism was fairly low in the sample, general re-offending rates was significantly high. Fifty-nine per cent of the sample had committed at least one offence over the follow-up period, with 15% classed as severe offenders, 40% as moderate and 4% considered minor. Of those which had committed an offence, 12.6% had received a prison sentence. Overall, childhood firesetting and previous experience of abuse were predictive of later offending behavior. Stewart and Culver (1982) were interested in how firesetting behavior related to age, IQ, and psychiatric disorders in a sample of 46 children admitted to a psychiatric ward. At the five-year follow-up after treatment, six out of 30 subjects continued to set fires. Furthermore, those who continued to set fires displayed more antisocial tendencies than those who did not. As mentioned in previous studies, the majority of children came from disruptive homes. Despite the specialist population and small sample size, such findings illustrate the relationship between childhood firesetting and later antisocial behaviors.

Dadds and Fraser (2006) investigated 1,359 children in Australia aged between four and nine years, and found that firesetting was just one of the antisocial behaviors present in children who were experiencing psychopathology and various forms of family stress. Indeed, levels of firesetting were low within this population but results still showed that both male and female firesetting was associated with antisocial behavior and parental stress.

Furthermore, male firesetting was associated with animal cruelty, hyperactivity and thrill seeking temperaments. Based on these findings, it appears that firesetting in young males may be a better indicator of chronic antisocial behavior, as opposed to later adult violence.

These findings have since been replicated in a 10-year prospective study (Becker, Stuewig, Herrera & McCloskey, 2004). The authors investigated the relationships between family risk factors, childhood firesetting and animal cruelty, and later delinquency. In 1990, children and their parents provided information concerning family risk factors and problem behavior which was followed by interviews with 86% of the sample in 1996 and 1998. Further case files were reviewed once again in 2000, which provided information on later delinquency. Becker et al. (2004) found that marital violence, paternal animal cruelty, paternal alcoholism, and a diagnosis of conduct disorder were related to childhood firesetting. Moreover, firesetters were three times at risk of juvenile court referral and three times at risk of arrest for a violent crime. These findings support that firesetting is related to later antisocial behaviors; however, these findings also highlight the domestic characteristics which increase the likelihood of childhood firesetting.

Conclusions and Implications for Future Research

Past and current research investigating the Macdonald Triad's validity in predicting future violence has been mixed in its support. Studies looking explicitly at all three childhood characteristics of the triad are mostly dated, while psychological and psychiatric research and practice has developed greatly despite the research time lag. Discrepancies within the literature also make it difficult to draw any firm conclusions; however these inconsistencies should not discount the potential predictive nature of the characteristics on their own. One recurring theme which has emerged from the literature examining the predictive validity of the complete triad of behaviors is a dysfunctional home environment (Prentky & Carter, 1984; Wax & Haddox, 1973). That is, the presence of one or more of the triad behaviors is

indicative of maladaptive home and family conditions. While this does not help to clarify whether the triad does predict future violence, it does provide a clearer understanding of the circumstances under which the triad behaviors co-exist.

On reviewing the empirical research focusing on each triad behavior, it is also clear that the empirical evidence is still lacking. Enuresis is not a valid predictor of future violent behavior, instead it is predominantly linked to physiological functions, or heightened emotions such as stress (Joinson et al., 2007b; Sureshkumar et al., 2009). In contrast, literature focusing on animal cruelty and firesetting provided more promising findings for a predictive relationship for later violence. However, rather than being indicative of violence, it is more likely that animal cruelty and firesetting are indicative of general anti-social behavior (Felthous & Kellert, 1987). Moreover, while some violent offenders do exhibit one of the three behaviors, they rarely exhibit all three (Weatherby et al., 2009) as specified in the theoretical proposition. Rather, research has identified a number of traits which are found much more consistently in these offenders, such as callous disregard for others (Vincent, Vitacco, Grisso, & Corrado, 2003).

From this, it is clear that there is room for more empirical studies to clarify the predictive/causal relationship between firesetting, bedwetting and animal cruelty, and later adult violence. The importance of establishing this link is highlighted when one considers the potential consequences and practical implications of utilizing this theoretical proposition without the empirical support. For example, children identified as exhibiting one or more of these behaviors could be wrongly considered as dangerous. This is potentially more damaging than helpful. The existing research shows that the presence of one or more of these behaviors is highly indicative of a stressful home environment and/or developmental disabilities (Prentky & Carter, 1984; Singer & Hensley, 2004; Wax and Haddox, 1973). So, rather than being labelled by others as potentially violent, the presence of these behaviors

should be treated as warning signs that the child is in need of professional attention and/or emotional support.

What is also lacking in the existing research is the acknowledgement of the cultural forces that may facilitate any one of the triad behaviors. The studies we have reviewed are conducted in solitary, Western contexts. But it is worth considering (coming from a social learning perspective) how adults (e.g., caregivers) react to children engaging in bedwetting, animal cruelty, and/or firesetting, and whether this varies across different cultures. Presumably there are differences because some cultures, for example, would positively reinforce the use of fire as a powerful tool, whereas others would not. The existing research on the triad behaviors does not take these cross-cultural differences into account, further limiting the generalizability of the research that does (even modestly) support the Macdonald triad.

Based on the literature presented, it is recommended that future research focuses on answering the questions which have been identified throughout this review. Firstly, research needs to further examine the motivations underlying firesetting in childhood, to identify whether it is used by children as a coping mechanism for emotional abuse suffered in and outside of the home. In doing so, early warning signs for potentially damaging home environments can be identified and acted upon appropriately. Furthermore, research has shown that when certain characteristic behaviors of the triad are present, violence is more likely to occur at a later stage (Tallichet & Hensley, 2004; Hensley, Tallichet, & Dutkiewicz, 2009). It has also shown that some elements are more likely to co-occur alongside others. For example, firesetting and animal cruelty are more likely to co-exist than enuresis (Slavkin, 2001). Therefore, future research should aim to identify whether a combination of firesetting and animal cruelty can predict later violence when they co-exist.

Finally, whilst the empirical research reviewed has not shown compelling evidence to support the triad, it has highlighted a number of variables outside of the triad which should also be considered as potential indicators for later violence (e.g., callous disregard for others; Vincent, Vitacco, Grisso, & Corrado, 2003). Thus, future research would benefit from broadening its scope to include psychological as well as behavioral indicators. In turn, practitioners will be equipped with the evidence base to inform early intervention prior to the development of the violent tendencies.

To conclude, this review has presented existing empirical research on the Macdonald triad, in order to determine whether the three characteristic behaviors (i.e. firesetting, bedwetting and animal cruelty), do in fact lead to future violence in adults. Based on the evidence, we would argue that there is a significant danger in using the triad as a diagnostic aide/framework in clinical practice. Although the literature recognizes that some elements of the triad are present in individuals who go on to commit later antisocial behaviors, there are numerous discrepancies surrounding its predictive value which has been highlighted throughout. Rather, the literature does show that the presence of the triad behaviors can be indicative of parental neglect, abuse or psychological deficits. While this is not what the triad was intended for, the existing evidence supports that the triad could be used as an aide to identify warning signs for dysfunctional home environments, or children who are finding difficulty coping with stress.

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