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Abstract

This exploratory systematic review assessed the quality of primary studies on young people who kill and synthesised the findings regarding the characteristics of these offenders. An electronic search yielded 12,717 hits of papers published between 1989 and 2012. Of these, 8,395 duplicates, 3,787 irrelevant hits, and 527 publications not meeting the inclusion criteria of the review were excluded (15 publications were added after searching the grey literature), leaving 23 good quality studies. From these, a further seven were removed due to their small sample size (i.e., $n < 30$), leaving a total of 16 studies reviewed in detail. A search update was carried out on 2 February 2014 and no further studies meeting the inclusion criteria were found. The results indicate that juvenile homicide offenders are a heterogeneous group and the risk factors for juvenile homicide are cumulative and evolve through life. The findings are mixed, but ten risk factors are identified which appear to be consistent for offenders across the studies reviewed. The limitations of the current review are highlighted and recommendations for future research are outlined, with particular consideration given to improving the quality of the literature in this field.

Key words: juvenile homicide, systematic review, risk factor

1. Introduction

Juvenile homicide is a rare event, but has increasingly been making media headlines since the 1990s. According to Rodway et al. (2011), approximately 12% of homicides in Canada are committed by young people per year, 10% in the United States of America (USA), 8% in Finland, and 6% in England and Wales. Despite being a rare event, a number of empirical studies have been conducted in an effort to understand the offence, motivations and characteristics of these young offenders (see Heide, 2003 for a summary). However, these studies tend to be diverse in content and primarily comprised of case studies (Heide, 2003).

Two literature reviews have previously been carried out regarding juvenile homicide. A comprehensive literature review was conducted by Heide (2003), focusing on clinical and empirical findings, as well as the treatment of the offenders. The second literature review (Shumaker & Prinz, 2000) concentrated on the characteristics of pre-teen homicide offenders (under 13 years old). The existing literature on juvenile homicide offenders has successfully explored the demographic, psychiatric, familial and social characteristics associated with these offenders (Heide, 2003). However, Heide (2003) provides recommendations concerning enhanced methodological designs to explore the aetiology, interventions and long-term outcomes. In addition, Shumaker and Prinz (2000) suggest that, despite their differences, pre-teens share similarities with adolescent homicide offenders in terms of background characteristics, such as domestic violence and abuse, poor parenting and instability. They also found weak evidence to support the existence of different etiologies between pre-teen and adolescent homicide offenders.

2. The difficulty of defining juvenile homicide

Existing studies relating to juvenile homicide are heterogeneous in terms of their content because of inconsistent definitions used across the literature. There are not only incongruities

relating to the meaning of the term 'juvenile', but also different legal definitions of what constitutes homicide. Indeed, homicide is defined differently depending on the country in which it occurs. In England and Wales, according to the Crown Prosecution Service (2013), homicide includes the offences of murder, manslaughter, infanticide and causing death by dangerous or careless driving. In Scotland, homicide refers to the offences of murder and culpable homicide (Scottish Government, 2012).

International agencies also vary in terms of how they define homicide, as well as which offences constitute homicide. For instance, the European Commission (2013) refers to homicide as the "intentional killing of a person" (para. 1). It includes offences such as murder, manslaughter, euthanasia and infanticide. On the other hand, the United Nations (2012) define homicide as "unlawful death purposefully inflicted on a person by another person" (para. 1). While the definitions (and offences included within the definitions) of homicide may differ, they all consist of similar elements, that is, a person has been killed, there was an intention to kill that person, and there is a human offender (Smit, De Jong & Bijleveld, 2012).

In United Kingdom (UK) legislation, the terms 'juvenile' and 'youth' are used interchangeably. In some instances these terms refer to all individuals under the age of 18, while in others they only refer to those aged 14 to 18. However, it is generally accepted that a 'child' is someone aged 13 or below, a 'young person' refers to someone between the ages of 14 and 17, and a 'young adult' is someone aged 18 to 21 (Penal Affairs Panel, 2009). The term 'juvenile' appears to be used far more frequently in the USA legislation, and whether or not an individual is classified as a 'juvenile' is determined by a judicial decision. Depending on the state, a juvenile is usually someone under the age of either 17 or 18 (Heide, 2003).

Some authors (e.g., Carcach, 1997) argue that the term 'youth' refers to a broader concept that encompasses all those going through adolescence, and can thus be defined as

anyone under the age of 24. Across Europe, the age relating to juvenile delinquency also differs, with the age of criminal responsibility being eight in Scotland, 10 in England and Wales, 13 in France, 14 in Germany, 16 in Spain, and 18 in Belgium (Marttunen, 2008). The young offenders referred to in this paper are individuals under the age of 21. This is because 21 is the legal age in most European countries and also incorporates puberty, psychological and physical development.

3. Characteristics of juvenile homicide offenders

A number of characteristics have been identified in relation to juvenile homicide offenders. These include characteristics relating to their background (e.g., low socio-economic status, harsh parenting and exclusion from school) and their environment (e.g., availability of weapons, family disorganisation, abusive home environment and violent family life) (Darby, Allan, Kashani, Hartke & Reid, 1998; Hill-Smith, Hugo, Hughes, Fonagy & Hartman, 2002). The social learning approach, developed by Bandura (1986), states that learning results from a combination of human interactions and environmental influences. Bandura's (1986) theory focuses on observational learning, where an individual models his or her behaviour on that of others after observing their behaviour. The observed behaviour is adopted or changed according to the consequences experienced by the individual (referred to as reinforcement and punishment). Studies in which aggressive behaviours (e.g., punching or hitting) were modelled by adults show that exposure to aggressive models increases the rate of imitation by children (see Gonzalez, 2001). Research also shows that the parents of juvenile homicide offenders tend to provide a model of violence as shown in Hardwick and Rowton-Lee (1996) in which parricide offenders are more likely to have experienced severe abuse by their families. According to Roe-Sepowitz (2007), risk factors concerning the background characteristics of female juvenile homicide offenders include family disruption and lack of

parental supervision. She also found that sexual abuse occurred in 20% of cases and more than half of the offenders experienced a history of substance use.

A comprehensive study carried out by Heide (1997) identified 15 primary factors associated with juvenile homicide offenders in the 1990s. These factors belong to five broad categories: the situation, societal influences, resource availability, personality characteristics and cumulative effect. Heide (1997) suggests that these categories contribute towards the escalation of juvenile homicide in the USA. She also highlights other contributing factors, such as psychological disorders, neurological impairments, influence of home environment, involvement in antisocial behaviour, substance abuse, and other social difficulties (e.g., truancy, dropping out or being expelled from school).

In addition to the work of Heide (1997, 1999, 2003), other studies have examined the criminal involvement of parents (Busch, Zagar, Hughes, Arbit & Bussell, 1990; Lindberg et al., 2009; Zagar, Arbit, Sylvies, Busch & Hughes, 1990), gang membership (Busch et al., 1990; Zagar et al., 1990), and previous arrests (Carter, 1999; Myers, Burgess & Nelson, 1998; Zagar & Grove, 2010).

The Pittsburgh Youth Study (Loeber & Farrington, 2011) is a prospective longitudinal study that followed 1,517 males from childhood to early adulthood. It is the first study of its kind to prospectively gather information on the lives and living conditions of men growing up in a medium-sized city in order to explore those who would later become homicide offenders, victims, or neither. Between 1987 and 2009, 37 participants (aged 15-29) were convicted of homicide. It is important to note that this includes first, second and third degree murder, manslaughter, vehicular homicide, and 'unknown degree' murder. Four fifths of these offenders had committed their offences by the age of 20, peaking at 18 to 19 years old. Despite the age range being older in this study, it seems important to report their findings because it is the only recent longitudinal study examining young people who later go on to

offend. According to Heide (2012), this study by Loeber and Farrington (2011) is ground-breaking due to its longitudinal nature, large sample, comparative analyses, utilisation of several control groups, inclusion of both self-reported delinquency and official reports, and the use of multiple informants as well as standardised measures when appropriate and available.

The risk factors determined by Loeber and Farrington (2011), which are associated with becoming a homicide offender, include environmental and socio-economic factors (e.g., neighbourhood, low socio-economic status, and young and unemployed mother). They found that these factors were more important in terms of predicting homicide offenders than individual risk factors. As a result, African American boys were more at risk of committing homicide due to the high prevalence of environmental and socio-economic risk factors. In terms of behavioural risk factors, suspension from school, disruptive behaviour, and positive attitudes towards delinquency strongly predicted violence. Factors that were found to be non-significant comprised of those relating to the individual's parents, peers, low school achievement, and psychopathic characteristics (e.g., lack of guilt and cruelty). Loeber and Farrington (2011) conclude that homicide is best predicted by a range of risk factors and not by a single predictor.

Heide (2003) reports a consensus between the studies she reviewed that suggest that a 'typical' juvenile homicide offender is male, unlikely to suffer from psychosis or be mentally ill, shows low achievement at school, has witnessed or experienced violence at home, has a prior arrest record, and is likely to use and/or abuse substances (i.e., drugs and alcohol). However, Heide (2003) highlights that the findings in this research area are mixed and fraught with methodological problems (e.g., case studies, absence of a comparison group, and sample drawn from psychiatric populations referred for assessment or treatment). These methodological problems do not allow for any accurate generalisations to be made.

While past research on juvenile homicide has tended to rely on case studies, stronger empirical work is being carried out more frequently. The quality of the research in this subject area has improved over the last decade and important longitudinal cohort studies have been published in 2011. There is currently a need for a more up-to-date systematic review of the empirical research on juvenile homicide in order to synthesise findings, gain further understanding in this area, inform future research, and highlight the challenges researchers face when conducting research with this specific population.

4. The purpose of the current systematic review

This review seeks to systematically explore and synthesise the current knowledge (both published and unpublished primary research in all languages) concerning juvenile homicide offenders. It is an exploratory analysis that will assess the heterogeneity and quality of the studies before their findings are synthesised. Priority has been given to findings from studies that draw on high quality study designs with the least amount of bias possible. Priority has also been given to case-control and cohort studies. The results from these studies will be summarised, providing researchers with up-to-date knowledge of the subject area and identifying gaps in the literature to prompt future research. This systematic review carries implications for preventing juvenile homicide, as it will highlight the risk factors relating to young people who kill. This will allow for future identification of those young people most at risk so that they can be supported by appropriate interventions being put in place.

5. Method

5.1. Inclusion criteria for the review

Studies that met the following criteria were included in the review:

1. Population: juvenile, aged 0 to 21 years old

- Target group: juvenile homicide offenders
- Comparison group: non-homicidal young people

2. Exposure: exploring the personal characteristics and risk factors of juvenile homicide offenders
3. Outcome: the victim died as a result of the homicide
4. Study type: cohort or case-control primary studies
5. Language: all languages

The type of exposure included in this review was kept broad in order to fully explore the subject area. Studies were excluded from the review if they included: child murder where the child is the victim and not the offender, legal issues and policies regarding homicide and school shootings, post-traumatic stress disorder and consequences for survivors following homicide among young people, child soldiers, and manslaughter. Additionally, conference abstracts that did not contain primary study data, book reviews, and secondary studies based on media reports were excluded. The analysis of victim characteristics and crime scene characteristics were also beyond the scope of this review.

5.2. Search methods for identification of studies

Ten databases were searched to identify relevant published and unpublished studies. These are: PsycINFO (Ovid), Medline (Ovid SP), Science Direct, Web of Knowledge (ISI), SCOPUS, Cochrane Library, PubMed, Sociological Abstracts, Social Services Abstracts, ProQuest dissertations and theses. A scoping exercise helped develop and refine the search terms for the review. These were verified by the faculty team librarian. The following search terms were used with truncation in the title and abstract: ((child* or kid* or young* or youth* or juvenil* or teenag* or adolescen*) AND (murder* or kill* or slaughter* or manslaughter* or homic* or massacre* or shoot*)), with and without MeSH terms or thesaurus. Due to a

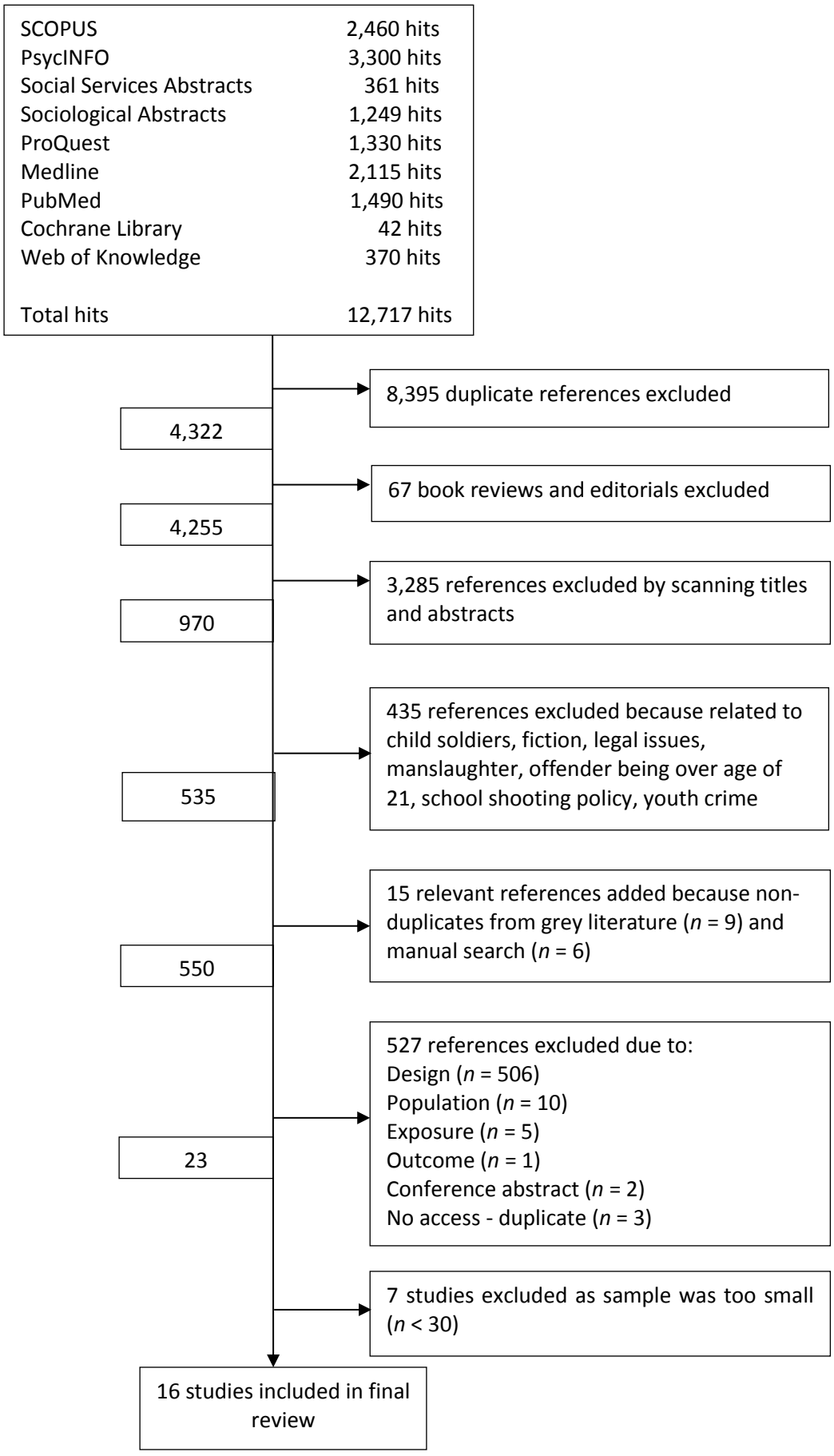
high number of repeatedly irrelevant hits, the following terms were excluded from the search: (kidney* or disease* or cell* or natural* or whale* or malnutrition* or pathogen* or zone* or fish* or vaccine* or plant* or animal* or infection* or tumor* or tumour* or flower* or malaria* or diarrhoea* or accident* or humanitar* or tree*). This was done by using the Boolean operator 'NOT' to help refine the search. A limit of time was set by only including studies published between 1989 and 2012. This period of time was chosen as it marks the development and testing of typologies on juvenile homicide offenders (e.g., Benedek & Cornell, 1989) and the increase in the number of empirical studies conducted.

In order to include all available studies, a manual search of relevant papers' references was also carried out. Additionally, a further two authors (Brownstein and Bailey) were contacted to locate unpublished works. Copac articles written in all languages were considered and the grey literature was searched, including the websites for the Ministry of Justice, Home Office, Federal Bureau of Investigation, and Youth Justice Board. A second reviewer applied the inclusion criteria to 10% of the 12,717 hits identified (n = 1,272). This was to assess inter-rater reliability, of which the level of agreement between raters was high (Cohen's $\kappa = .98$).

5.3. Data collection and analysis

The first search was carried out on 28 March 2012 and the last search on 17 April 2012. A search update was carried out on 2 February 2014 and no further studies meeting the inclusion criteria were found. Figure 1 summarises the search strategy used for the review.

Figure 1. Search strategy of systematic review



This search generated 12,717 hits, with papers dating back until 1989. After the exclusion of duplicate papers (n = 8,395) and application of the inclusion criteria, 535 remaining hits appeared to be relevant based on their title and abstract. These 535 articles can be grouped into nine categories: gang-related, serial killer, sexual killer, homicide, neonaticide/infanticide, murder/suicide, parricide, siblicide, and school shooting. The nine categories represent different thematic emphases of the studies on juvenile homicide and highlight the heterogeneity of the literature in this area.

In addition to the 535 articles, a further 15 papers were added to the review. These papers were from grey literature (n = 9) and the result of a manual search (n = 6). A quality assessment then took place, which considered the design, population, exposure and outcome. A total of 527 studies were eliminated based on this quality assessment. While the research in this field is dominated by case studies, a number of case-control and longitudinal cohort studies have been conducted in recent years. Case-control studies identify predictors and assess their influence on the outcome. Longitudinal cohort studies describe incidence or natural history, allowing the analysis of risk factors and measuring events in a temporal sequence (Mann, 2003). In order to improve the reliability of the review's findings, the inclusion of studies was limited to case-control and longitudinal cohort studies (Level 3 in the Centre for Review and Dissemination hierarchy of evidence, 2003).

Only high quality studies were kept and the full text of the paper was needed to verify the presence of a control group. As three publications were inaccessible within the time frame of the review, they were excluded. Seven of the case-control studies were also removed from the review because they had a sample of less than 30 juvenile homicide offenders, which limited the generalisability of their findings. A total of 16 studies were thus left in the final review (i.e., four cohort studies and 12 case-control studies).

These studies were assessed using a quality appraisal checklist, which was an adaptation of a checklist developed by the Critical Appraisal Skills Programme (2006). It covers selection, measurement and attrition bias. Based on the quality assessment, 24 items (in terms of cohort studies) and 16 items (in terms of case-control studies) were used to determine the risk of bias in each study. Two points were awarded to a study if it met a quality criterion, one point was awarded if it partially met a criterion, and zero points were awarded if it did not meet a criterion. The points for all the quality criteria were then added and a higher overall score meant that the study was of a high quality. According to Sanderson, Tatt and Higgins (2007), an overall quality score may not be the best way to determine a study's quality. As a result, an assessment of each area of bias was also conducted (e.g., selection, sampling, population, measurement, classification, and attrition). Each area of bias was assessed (where 0 = low risk, 1 = unclear, and 2 = high risk), resulting in a score of 0-4 for cohort studies or 0-6 for case-control studies. Higher scores indicated a higher risk of bias in the study. This follows the procedure recommended by the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins & Green, 2011) and the Cochrane Collaboration's tool for assessing risk of bias (Higgins & Altman, 2008). Table 1 summarises the risk of bias in each study included in the review.

Table 1. Risk of bias in each study

	Selection bias – Referral bias	Selection bias – Population	Measurement bias	Measurement – Instruments valid	Measurement – Expectancy bias	Attrition bias
Bailey et al. (2001)	+	?	-	?	?	
Busch et al. (1990)	+	-	-	?	?	
Busch et al. (2009)	+	?	+	?	+	-
Carter (1999)	-	?	-	?	?	
Crimmins et al. (2000)	-	+	+	?	?	
DiCataldo et al. (2008)	+	-	?	+	-	

Dolan et al. (2001)	?	-	+	?	-	
Greco et al. (1992)	+	?	-	-	-	
Hughes et al. (2009)	+	?	+	?	+	-
Lindberg et al. (2009)	+	+	-	?	-	
Reyes (1991)	?	+	+	+	-	
Shumaker et al. (2001)	+	?	-	?	?	
Zagar et al. (1990)	+	-	-	?	+	
Zagar et al. (2009a)	+	?	+	?	+	-
Zagar et al. (2009b)	+	?	+	?	+	-
Zagar et al. (2010)	+	+	-	?	+	

Note. High risk of bias (+), low risk of bias (-), unclear (?)

Once the quality assessment had been conducted, a random selection of 22% of the 23 studies was independently assessed by a second reviewer. In order to establish inter-rater reliability, the same quality appraisal checklist was used to assess the studies. As each area of bias was ascribed an ordinal score, weighted κ was used to evaluate the degree of disagreement between the raters (Sim & Wright, 2005; Viera & Garrett, 2005). Any disagreements between the raters were resolved through discussion, leading to a final 100% agreement on all areas of bias.

Data relating to study characteristics and risk factors associated with juvenile homicide were extracted from the 16 studies and are presented in the results section (please refer to the original articles for the definitions of the risk factors). The significance level of each risk factor was also examined to determine its frequency in the offender group versus the comparison group. Due to the diverse samples across the 16 studies, as well as the limitations of their study design and the bias inherent within them, meta-analysis is not appropriate for the presentation of their results. A qualitative data synthesis was therefore performed and is presented in the results section. The *p*-values reported in the original 16 studies were used to determine the significance of the results.

6. Results

Table 2 provides a description of the 16 studies included in the review, as well as significant risk factors associated with juvenile homicide. The diversity across the studies is clear. They differ in terms of type of sample (i.e., different types of juvenile homicide), size of sample, age of offenders (i.e., ranging from 10 to 21 years old), and type of control group (e.g., violent offenders or non-violent offenders). The aims of the studies also vary, and they span the years 1990 to 2010. Most of the studies were conducted in the USA (*n* = 13), while two took place in the UK, and one was conducted in Finland. The terms 'youth', 'adolescent' and 'juvenile' are used interchangeably across the studies, and the age of inclusion as a young offender varies. This is linked to the issue of definition of juvenile homicide offenders (as outlined in the introduction), which is deeply ingrained in the research in this field.

Table 2. Description of 16 studies included in review and significant risk factors

Study	Study population	Risk factors	Significance
- Bailey, Smith & Dolan (2001) - Retrospective case-control - UK	- Adolescent forensic service - Referred for psychological assessment - 39 homicide offenders - 78 arson offenders - Aged 10-17 - Male Caucasian - Data collected: 1987-1999	- Arson offenders displayed more risk factors than homicide offenders	- No significant results for homicide offender group
- Busch et al. (1990) - Retrospective case-control - USA	- 71 homicide offenders - 71 non-violent delinquents - Aged 10-17 - Matched on race, age, gender and socio-economic status - Data collected: 1981-1986	** Violent family ** Gang membership ** Alcohol abuse ** Severe education difficulties ** Physically abused ** Drug abuse ** Learning difficulties	Rao's V: 11.98 McNemar: 16.57 McNemar: 8.31 Rao's V: 54.17 McNemar: 3.89 Rao's V: 34.71 Rao's V: 57.74 Rao's V: 82.80 Rao's V: 34.71
- Busch, Zagar, Grove, Hughes,	- 223 delinquent rapists	A) Compared to control:	

Arbit, Bussell & Bartikowski (2009) - Cohort study - USA	- 223 delinquent molesters - 223 non-violent delinquents - 7 became juvenile sexual homicide offenders - Randomly selected - Individually matched - Data collected: 1980-1988	** Not with parents until age 14 ** Personality disorder * Violent family ** Low socio-economic status * Male ** Single parent ** Prior court contact for violent offences ** Prior court contact for delinquent offences ** Prior court contact for all offences ** Underachieves ** Poor executive function B) Compared to matched non-violent delinquents: * Single * Violent family * Low socio-economic status * Male * Truancy ** Prior court contact for violent offences * Prior court contact for delinquent offences	$t = 3.53$, $p < .01$ $t = 3.87$, $p < .01$ $t = 2.12$, $p < .05$ $t = -3.54$, $p < .01$ $t = 2.44$, $p < .05$ $t = -4.92$, $p < .01$ $t = 3.87$, $p < .01$ $t = 4.58$, $p < .01$ $t = 6.87$, $p < .01$ $t = 4.08$, $p < .01$ $t = 9.55$, $p < .01$ $t = 2.83$, $p < .05$ $t = 2.12$, $p < .05$ $t = -2.45$, $p < .05$ $t = 2.45$, $p < .05$ $t = -2.85$, $p < .05$ $t = 3.87$, $p < .01$ $t = 2.70$, $p < .05$
- Carter (1999) - Retrospective case-control - USA	- 32 homicide offenders - 32 juveniles remanded to adult court on felony offences other than homicide - Under 18 years old - Male - Matched on age and ethnicity - Data collected: 1995	*** Homicide offenders had previous knowledge of victim	$p = .001$
- Crimmins, Cleary, Brownstein, Spunt & Warley (2000) - Retrospective case-	- 83 homicide offenders - 145 robbery offenders	- No statistical comparison provided - Odds ratio were calculated to compare	

control - USA	- 115 assault offenders - 71 sexual assault offenders - All in custody - Aged 12-21 - Data collected: 1995-1996	homicide offenders with an average of the three comparison groups * Attacked someone to hurt them ** Owned a gun ** Used a gun	 *OR* = 1.83 *OR* = 2.61 *OR* = 3.05
- DiCataldo & Everett (2008) - Retrospective case-control - USA	- Secure detention programme - 33 offenders charged or convicted of homicide - 38 individuals adjudicated for a violent offence - Average age: 16 - Male - Data collected: 1995-1998	** Early positive memories of mother ** Early positive memories of father * Gun routinely kept at home * Took gun from home	χ^2 (1, 47) = 15.50, *p* = .004 χ^2 (1, 49) = 14.69, *p* = .005 χ^2 (1, 67) = 4.90, *p* = .027 χ^2 (1, 70) = 4.53, *p* = .033
- Dolan & Smith (2001) - Retrospective case-control - UK	- 46 homicide offenders - 106 fire-setters - Aged 10-17 - Matched on age, ethnicity, socio-economic status and criminal history - Referred to same unit for assessment during same time period - Data collected: 1986-1996	* Male ** Attended multiple schools	χ^2 (1, 46) = 4.15, *p* < .05 χ^2 (1, 46) = 8.00, *p* < .01
- Greco & Cornell (1992) - Retrospective case-control - USA	- Clinical sample - 55 homicide offenders (2 groups: conflict and crime) - 55 non-violent offenders convicted of larceny, breaking or entering, but without prior charges for violent offences - Aged 12-18 - Matched on age, race and gender	- No significant differences were observed between groups	- No significant results
- Hughes, Zagar, Busch, Grove & Arbit (2009)	- 181 abused children divided into four groups:	A) Compared to control: * Child respiratory,	 *t* = 2.47, *p* < .05

- Cohort study - USA	1. later homicidal 2. later violent 3. later delinquent 4. later non-delinquent - Records followed for nine years - Data collected: 1980-1988	infectious, neurological, genitourinary, pregnancy, childbirth, or perinatal complications	
		** Parent abused substances	$t = 6.00$, $p < .01$
		** Parent abused alcohol	$t = 6.00$, $p < .01$
		** Violent family	$t = 6.00$, $p < .01$
		** Physically abused parent	$t = 47.25$, $p < .01$
		** Parent abused alcohol and substances	$t = 9.00$, $p < .01$
		** Parent member of gang	$t = 3.67$, $p < .01$
		* Child truancy, suspension or expulsion	$t = 2.06$, $p < .05$
		* Child epilepsy	$t = 2.45$, $p < .05$
		* Child was in psychiatric hospital	$t = 2.45$, $p < .05$
		* Male	$t = 2.47$, $p < .05$
		* Low socio-economic status	$t = -3.29$, $p < .05$
		* Single parent	$t = 4.59$, $p < .05$
		** Later parent and child in court contact	$t = 16.75$, $p < .01$
		** Poor executive function	$t = 8.27$, $p < .01$
		** Child illness	$t = 5.13$, $p < .01$
		B) Compared to matched later non-delinquent group:	
		** Child underachieves	$t = 9.00$, $p < .01$
		* Child respiratory, infectious, neurological, genitourinary, pregnancy, childbirth or perinatal complications	$t = 2.47$, $p < .05$
		** Parent abused substances	$t = 4.20$, $p < .01$
		** Parent abused alcohol	$t = 6.00$, $p < .01$

		** Violent family	$t = 6.00$, $p < .01$
		** Physically abused parent	$t = 3.29$, $p < .01$
		** Parent abused alcohol and substances	$t = 4.93$, $p < .01$
		** Parent member of gang	$t = 3.67$, $p < .01$
		** Male	$t = 4.20$, $p < .01$
		** Low socio-economic status	$t = -2.61$, $p < .01$
		** Later parent and child in court contact	$t = 8.13$, $p < .01$
		** Poor executive function	$t = 8.44$, $p < .01$
- Lindberg et al. (2009) - Retrospective case-control - Finland	- 57 male juvenile homicide offenders referred for psychiatric examination - Aged 15-19 - 57 male adult homicide offenders - Randomly selected - Data collected: 1995-2004	Risk factors for juveniles scoring 26 or higher on PCL-R:	
		* Previous criminal history	$\chi^2 = 4.07$, $p = .04$, $\phi = .27$
		* Excessive violence during index homicide	$p = .04$, $\phi = .31$
		* Not living with both parents	$p = .02$
		* Institutional or foster home placement in childhood	$\chi^2 = 2.39$, $p = .03$, $\phi = .29$
		** Parent has criminal history	$\chi^2 = 7.75$, $p = .01$, $\phi = .37$
		** Parent or close relative with history of homicide	$\chi^2 = 7.75$, $p = .01$, $\phi = .37$
		* School difficulties	$\chi^2 = 4.95$, $p = .03$, $\phi = .30$
		** Special education	$\chi^2 = 13.68$, $p = .01$, $\phi = .49$
		* Mental health contact prior to age 18	$\chi^2 = 4.07$, $p = .04$, $\phi = .27$
- Reyes (1991) - Case-control, quasi-experimental - USA	- Case-study group: 32 males who were treated in groups and met for 13 weeks - Control group: 32 males incarcerated for aggravated assault - Content same for	* Low mean scores on hostility-aggression post-test for treatment group	$r = .38$, $p < .05$
		* Relationship between empathy and hostility-aggression on pre-test for treatment group	$r = .30$, $p < .05$

	each group - Average age when committed offence: 15 - Matched on proximity to release eligibility - Excluded: individuals with psychosis, learning difficulties, or suffering from major affective disturbance or pervasive developmental disorder	* Relationship between full scale IQ score and locus of control post-test for whole sample (slightly more for treatment group) * Relationship between longer sentences and locus of control post-test for whole sample * Relationship between number of offences committed and empathy on post-test for treatment group * Relationship between number of offences committed and hostility-aggression scores on post-test for treatment group * Relationship between greater number of offences associated with higher, more external locus of control for treatment group	$r = .38$, $p < .05$ $r = .28$, $p < .05$ $r = -.42$, $p < .05$ $r = -.35$, $p < .05$ $r = .35$, $p < .05$
- Shumaker & McKee (2001) - Retrospective case-control - USA	- 30 males charged with murder - 62 males charged with other violent felony offences - Average age: 15 - Data collected: 1987-1997	** Raised by one or both parents * Less likely to have attempted suicide in the past * Less likely to be an only child ** Less likely to have used mental health services at time of offence *** Less likely to have been diagnosed with an Axis 1 mental disorder	$p < .01$ $p < .05$ $p < .05$ $p < .01$ χ^2 (1) = 27.0, $p <$ .001
- Zagar et al. (1990) - Retrospective case-control	- 30 homicide offenders - 30 violent	Discriminant function: ** Criminally violent	χ^2 (1) = 41.80, $p <$ .01

- USA	delinquents (e.g., property offences, theft, truancy) - Matched on age, race, gender and socio-economic status - Aged 10-17 - Data collected: 1981-1986	family ** Gang participation ** Alcohol abuse ** Severe educational deficits Discriminant function on combined samples (30+71 from previous study): ** Criminally violent family ** Gang participation ** Alcohol abuse ** Severe educational deficits - Showed more learning difficulties, epilepsy and central nervous system conditions during infancy	χ^2 (1) = 56.50, p < .01
- Zagar, Busch, Grove, Hughes & Arbit (2009a) - Cohort study - USA	- 26 homicide offenders - 26 non-violent delinquents - Matched on age and race - Historical groups comparison: 101 homicide offenders and 101 non-violent delinquents - Combined comparison: 127 homicide offenders, 127 matched non-violent delinquents, and 127 matched control	Predictors: Combined sample of homicide offenders and non-violent delinquents Poor executive function Weapon possession/conviction Low social maturity Special education	 *OR* = 6.18e-02, 97.5% CI *OR* = 5.06e-09, 97.5% CI *OR* = 62,132.38, 97.5% CI *OR* = .99, 97.5% CI
- Zagar, Busch, Grove, Hughes & Arbit (2009b) - Cohort study - USA	- 192 abused infants divided into four groups: 1. later homicidal 2. later violent 3. later delinquent 4. later non-delinquent - 192 random control group matched on age and race	Abused later homicidal group versus control group: ** Physically abused parent ** Infant hyperactivity ** Infant injury, burn, poisoning, substance exposure ** Parent member of	 *t* (40) = -20.00, p < .01 *t* (40) = -10.95, p < .01 *t* (40) = -10.95, p < .01 *t* (40) = -13.43, p <

	- Records followed for 12 years - Data collected: 1980-1988	gang ** Parent abused substances ** Parent abused alcohol ** Parent abused alcohol and substances ** Pregnancy, childbirth, perinatal complications ** Violent family ** Three or more home/school moves ** Infant sexual abuse ** Low socio-economic status ** Male ** Later parent and child court contact ** Poor executive function Abused later homicidal group versus abused later non-delinquent group: Same factors as above	.01 t (40) = -10.57, p < .01 t (40) = -8.72, p < .01 t (40) = -10.34, p < .01 t (40) = -5.35, p < .01 t (40) = -8.84, p < .01 t (40) = -4.82, p < .01 t (40) = -4.69, p < .01 t (40) = 3.16, p < .01 t (40) = -4.35, p < .01 t (40) = -37.27, p < .01 t (40) = -6.75, p < .01
- Zagar & Grove (2010) - Case-control, quasi-experimental - USA	- 1,127 young people - 1,595 adults - Control group of 2,722 individuals selected from 4,000 clinically referred young people - 47,987 abused and delinquent young people - Data collected: 1980-1988	In terms of the young people, 15 significant predictors of violence: ** Executive function ** Prior court contact ** Gender ** Both alcohol and substance abuse ** Violent family members ** Underachieve ** Illness ** Family composition ** Alcohol abuse ** Substance abuse ** Social maturity ** Physical abuse ** Truancy,	 p < .01 p < .01 p < .01 p < .01 p < .01 p < .01 p < .01 p < .01 p < .01 p < .01 p < .01 p < .01 p < .01

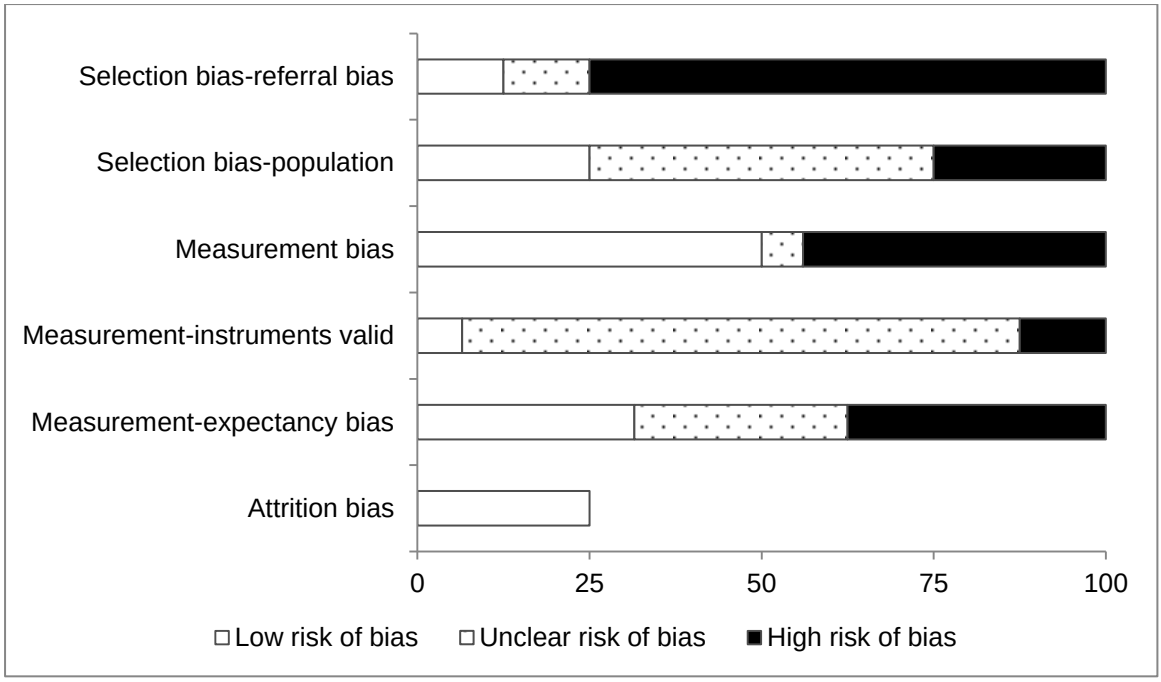
	suspension, expulsion	
	** Epilepsy	$p < .01$
	** Gang membership	$p < .01$

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

6.1. Risk of bias in studies reviewed

The Cochrane 'Risk of Bias' tool (Higgins et al., 2011) was used to assess the risk of bias in each of the studies reviewed. Only the four cohort studies were assessed for attrition bias, as in these studies all of the young people were tracked (backward or forward depending on the study). It is worth noting that case-control and cohort studies are particularly prone to selection bias, and the studies reviewed were no exception. Figure 2 shows the risk of bias across the 16 studies included in the review.

Figure 2. Risk of bias across the 16 studies



As can be observed in Figure 2, 75% of the included studies are at a high risk of selection-referral bias. This is where control cases differ from the cases in the homicide offender group in terms of risk factors or psychopathology. The differentiation is due to the control cases being referred for an assessment *because* of their level of risk in relation to

these factors. Only 25% of the studies were at a high risk of population bias. This is mainly a result of the absence of a matched group, the matching process, or the cases not being representative of the population.

In terms of measurement bias, 44% of the studies were at a high risk of bias. For instance, they used only one source of information (e.g., school reports, police reports, court reports, or family interventions), historical comparisons were made, or the participants may have been influenced in some way (i.e., due to volunteering or being paid to participate in the study). In 81% of the studies, the level of bias as a result of the instruments used (i.e., validity, reliability, standardisation, and inter-rater reliability) was unclear, as some instruments were validated and standardised while others were not. Additionally, there were occasions where limited information was provided regarding the tests used. A high risk of measurement-expectancy bias was found in 37.5% of the studies. This is where the expectations or knowledge of the researcher may unconsciously influence the questions or answers. No risk of attrition bias was observed across the 16 studies. This is defined as systematic differences between groups as a result of withdrawal or exclusion of participants.

Due to the retrospective nature of most of the included studies, the accuracy of recalling an event, childhood or developmental characteristics may have been affected. However, it is not possible to fully assess this problem. Additionally, samples in the studies were restricted to a specific geographical area, thus presenting difficulties regarding external validity when generalising conclusions to other populations.

6.2. Risk factors identified by cohort studies

Cohort studies are the best means of determining the occurrence and natural history of a condition (Mann, 2003). In retrospective cohort studies, the study is performed post-hoc and

data that were collected for another purpose are used. A cohort design enables studying the effect of each variable on the development of the outcome of interest (Mann, 2003).

Four cohort studies were included in the review, all of which were carried out by Zagar and his colleagues (Busch et al., 2009; Hughes et al., 2009; Zagar et al., 2009a; Zagar et al., 2009b). These studies used diverse, independent samples of randomly selected 'at risk' individuals in the USA. The participants were then matched on age and race to clinically-referred, non-violent delinquents (who were the control group), and their records were assessed over time to explore which individuals later committed homicide, assault, violent delinquent crime, or no crime. The design of each study was robust, but selection bias was present when using the clinically-referred individuals as participants. The samples used across the four studies consisted of abused infants who later committed homicide, abused children who later committed homicide, juvenile homicide offenders, and juvenile sexual homicide offenders. Table 3 summarises the risk factors identified by the four studies.

Table 3. Risk factors identified by the four cohort studies

Risk factor	Study			
	Busch et al. (2009)	Hughes et al. (2009)	Zagar et al. (2009a)	Zagar et al. (2009b)
<u>Demographics</u>				
Male	✓ **	✓ **	✓ *	
Low socio-economic status	✓ *	✓ **	✓ *	
Ethnicity		✓ **		
Family composition		✓ **		
<u>Gestational</u>				
Foetal substance exposure		✓		
Child respiratory, infectious, neurological, genitourinary, pregnancy, child birth, or perinatal complications		✓ **		✓ *
<u>Developmental</u>				
Executive function	✓ **	✓ *	✓ *	✓ *
Low social maturity	✓ (* CG)		✓ *	
<u>Illness and injury</u>				
Asthma			✓ **	
Jaundice			✓ **	

Epilepsy		✓ **	✓ *	
Illness	✓	✓ *		✓ *
Head injury			✓ *	
Neurological disease			✓ *	
Sleep disturbance			✓ **	
Psychological disorder				
Psychiatric hospitalisation		✓ **	✓ **	
Personality disorder	✓ *			
Individual characteristics				
History of alcohol/substance use/abuse			✓ *	
Relationship status: single	✓ **			
Infant hyperactivity				✓ *
Unemployed	✓ (** CG)			
IQ < 70			✓ *	
Parent characteristics				
Physically abused		✓ *		✓ *
Gang member		✓ *		✓ *
Alcohol/substance abuse		✓ *		✓ *
Criminally violent	✓ **	✓ *		
Violent family		✓ *		✓ *
Child not with parent until age 14	✓ *			
Live in mother/father home	✓			
Orphaned		✓ **	✓ **	
Single parent family	✓ *		✓ **	
Physical abuse			✓ **	
Sexual abuse				✓ *
Antisocial behaviour/delinquency				
Parent and child have prior contact with court			✓ **	
Parent and child had later contact with court		✓ *	✓ *	✓ *
Prior court contact for violent/delinquent offending	✓ *			
Truancy		✓ **	✓ *	
Gang membership			✓ **	
Education				
Low academic achievement	✓ *	✓ *	✓ **	
Suspension/expulsion		✓ **	✓ *	
Three or more home/school moves				✓ *
Weapon availability				
Weapon possession			✓ *	

Note. ✓ risk factor assessed, * $p < .05$ for juvenile homicide offender group, ** $p < .01$ for juvenile homicide offender group, CG risk factor significant for control group

As Table 3 shows, risk factors relating to demographics, gestation, development, illness and injury, psychological disorder, individual characteristics, parent characteristics, antisocial behaviour/delinquency, education, and weapon availability were identified. Of the risk factors assessed, foetal substance exposure and living in a mother/father home were not found to be significantly related to juvenile homicide. Additionally, unemployment and low social maturity were found to be significant risk factors for the control group and not the homicide offender group. The offender being male, low socio-economic status, executive function, parent and child later having contact with the court, and low academic achievement were the only risk factors found significant across three or more studies, which perhaps gives them greater weight.

6.3. Risk factors identified by case-control studies

Risk factors were also identified by the case-control studies that were reviewed. However, when considering these risk factors, it is important to take into account a limitation regarding the variety of comparison groups used (e.g., non-violent offenders, violent offenders, and non-offenders), which each include different characteristics. The risk factors explored by the case-control studies are outlined below.

In four of the studies, demographic characteristics were examined, but on the whole were not found to be significant risk factors. Juvenile homicide offenders' gender tends to be male was the only significant ($p < .01$, $p < .05$) risk factor highlighted by the studies (Dolan & Smith, 2001; Zagar & Grove, 2010). Age (DiCataldo & Everett, 2008; Shumaker & Mckee, 2001), ethnicity (DiCataldo & Everett, 2008; Dolan & Smith, 2001; Shumaker & McKee, 2001), level of education (DiCataldo & Everett, 2008), and socio-economic status (Shumaker & McKee, 2001; Zagar & Grove, 2010) were not found to be significant risk factors.

Only one study considered gestational risk factors (i.e., Busch et al., 1990), but found no significant differences between the homicide offender group and the control group in terms of neonatal problems or difficulties at birth (Busch et al., 1990). Illness and injuries were explored in three studies and on the whole were not found to be significant discriminating factors for the commission of homicide by young people. Zagar and Grove (2010), however, identified illness and epilepsy as being significantly more prevalent in the juvenile homicide offender group (both at the .05 level).

In terms of developmental risk factors, poor executive function and low social maturity were significantly more prevalent in the juvenile homicide offender group (both at the .05 level) (Zagar & Grove, 2010). Delays in development (Bailey et al., 2001; Dolan & Smith, 2001), conduct disorder (Dolan & Smith, 2001), and hyperactivity (Zagar & Grove, 2010) were not found to be significant risk factors.

Seven of the studies explored psychological disorders, but found few significant risk factors. Axis I mental disorders, prior counselling, prior contact for psychological support, and psychotic illness were significantly less prevalent in the juvenile homicide offender group than in the control group (Bailey et al., 2001; Busch et al., 1990; Carter, 1999; Dolan & Smith, 2001; Shumaker & McKee, 2001). Psychopathic deviancy and/or antisocial personality disorder was not found to be significantly related to juvenile homicide offenders (Lindberg et al., 2009; Zagar & Grove, 2010).

Risk factors relating to the offenders' parents and family were considered in nine of the studies. Violent family members ($p < .05$; Zagar & Grove, 2010), criminal family members ($p < .05$, Busch et al., 1990; $p < .05$, Zagar et al., 1990; $p < .01$, Lindberg et al., 2009), and positive early memories of parents ($p < .05$; DiCataldo & Everett, 2008) were found to be significant risk factors in some of the studies. Additionally, when comparing juvenile homicide offenders with adult homicide offenders, juvenile homicide offenders were

significantly ($p < .01$) more likely to be placed in care (Lindberg et al., 2009). Parents' psychopathology (Shumaker & McKee, 2001), sexual abuse (DiCataldo & Everett, 2008; Shumaker & McKee, 2001), neglect and long-term separation from parents (Shumaker & McKee, 2001), parents' employment status, and absent fathers (Zagar & Grove, 2010) were not found to be significant risk factors. The studies found insufficient evidence to draw any conclusions regarding physical abuse (Bailey et al., 2001; Busch et al., 1990; Shumaker & McKee, 2001; Zagar & Grove, 2010) and dysfunctional or harsh parenting (DiCataldo & Everett, 2008).

Substance abuse was assessed by several of the studies, seven of which considered alcohol abuse and five of which focused on drug abuse. Overall, mixed findings emerged from these studies. However, the use or abuse of alcohol was found significant in three of the studies (all at the .01 level) (Busch et al., 1990; Zagar et al., 1990; Zagar & Grove, 2010). The use or abuse of drugs was found significant in two of the studies (both at the .01 level) (Busch et al., 1990; Zagar & Grove, 2010).

In terms of anti-social or delinquent behaviour, prior contact with the court was the only significant ($p < .05$) risk factor identified (Zagar & Grove, 2010). Prior referrals, detainment, arrests, violent delinquency, arson, mistreatment of animals, and level of aggression were not found to be significant risk factors (Bailey et al., 2001; DiCataldo & Everett, 2008; Shumaker & McKee, 2001). However, prior delinquent acts with a knife (DiCataldo & Everett, 2008), being young at the time of first violent offence (Carter, 1999; DiCataldo & Everett, 2008), and delinquent acts to support substance abuse (DiCataldo & Everett, 2008) were significantly less prevalent in the juvenile homicide offender group than in the comparison group. Overall, the mixed findings do not provide enough evidence to support anti-social or delinquent behaviour being related to either the juvenile homicide group or the control group (Bailey et al., 2001; Dolan & Smith, 2001; Lindberg et al., 2009).

Studies that examined individuals' education showed that severe educational difficulties (Busch et al., 1990; Zagar et al., 1990), attending multiple schools (Dolan & Smith, 2001), and low academic achievement (Zagar & Grove, 2010) were significantly related to juvenile homicide offenders (all at the .05 level). Learning difficulties and attaining high grades were not found to be significant risk factors (Dolan & Smith, 2001; Shumaker & McKee, 2001), while suspension or expulsion from school showed mixed findings (Shumaker & McKee, 2001; Zagar & Grove, 2010).

Gang or group membership was significantly more prevalent in the juvenile homicide offender group ($p < .05$) (Busch et al., 1990; Zagar et al., 1990; Zagar & Grove, 2010). Additionally, Crimmins et al. (2000) found that owning a firearm and previously using a firearm were significantly related to the juvenile homicide offender group as opposed to the comparison group ($p < .01$). In terms of access to firearms, easy access in the community was not found to be a significant risk factor, while access at home was found to be significant ($p < .01$; DiCataldo & Everett, 2008).

7. Discussion

The aim of this exploratory systematic review was to assess the quality of primary studies on young people who kill and synthesise their findings regarding the characteristics of these offenders. The studies that were reviewed have considered the risk of juvenile homicide in terms of demographic characteristics, gestational factors, illness and injury, developmental factors, psychological disorder, parents and family, individual characteristics, antisocial behaviour/delinquency, education, and weapon availability. They show that risk factors are cumulative and develop across an individual's life span.

The review brings together a list of significant risk factors in relation to juvenile homicide, based on their presence in at least one cohort study and two or more case-control

studies, or two or more cohort studies and at least one case-control study. These risk factors are:

- Gender (male): Three cohort studies (Busch et al., 2009; Hughes et al., 2009; Zagar et al., 2009a) and two case-control studies (Dolan & Smith, 2001; Zagar & Grove, 2010).
- Low executive function: Four cohort studies (Busch et al., 2009; Hughes et al., 2009; Zagar et al., 2009a; Zagar et al., 2009b) and one case-control study (Zagar & Grove, 2010).
- Illness: Two cohort studies (Hughes et al., 2009; Zagar et al., 2009b) and one case-control study (Zagar & Grove, 2010).
- Epilepsy: Two cohort studies (Hughes et al., 2009; Zagar et al., 2009a) and one case-control study (Zagar & Grove, 2010).
- Violent family members: Two cohort studies (Hughes et al., 2009; Zagar et al., 2009b) and one case-control study (Zagar & Grove, 2010).
- Criminal family members: Two cohort studies (Busch et al., 2009; Hughes et al., 2009) and three case-control studies (Busch et al., 1990; Lindberg et al., 2009; Zagar et al., 1990).
- Contact with the court: Three cohort studies (Hughes et al., 2009; Zagar et al., 2009a; Zagar et al., 2009b) and one case-control study (Zagar & Grove, 2010).
- Low academic achievement: Three cohort studies (Busch et al., 2009; Hughes et al., 2009; Zagar et al., 2009a) and one case-control study (Zagar & Grove, 2010).
- Gang/group membership: One cohort study (Zagar et al., 2009a) and three case-control studies (Busch et al., 1990; Zagar et al., 1990; Zagar & Grove, 2010).
- Weapon possession: One cohort study (Zagar et al., 2009a) and two case-control studies (Crimmins et al., 2000; DiCataldo & Everett, 2008).

It is important to note that these risk factors should be considered with caution. It is quite possible that young people presenting these risk factors may never commit homicide. The mixed findings across the studies also show that a great deal more research is required in this area.

A possible reason why juvenile homicide offenders tend to be male rather than female is because they commit homicide for different reasons (Roe-Sepowitz, 2009). Male offenders are inclined to commit homicide during the commission of a crime, where the victims are often strangers. Conversely, female offenders tend to commit homicide during an interpersonal conflict with a family member or while responding to domestic stress (Heide, Roe-Sepowitz, Solomon & Chan, 2012; Loper & Cornell, 1996). Indeed, there is a higher rate of female children murdering a parent than male children (Roe-Sepowitz, 2009). As the offences of female offenders are likely to be more expressive in nature, while those of male offenders lean towards some form of instrumental gain, it stands to reason that the gender of juvenile homicide offenders should play a role in determining tailored treatment that addresses this risk factor (Roe-Sepowitz, 2009).

Executive functioning in juvenile homicide offenders may be low due to their living environment, particularly if living with an impoverished, violent family. It could also be as a result of poor parental involvement, as children usually learn healthy decision-making through interactions with their parents (Hughes et al., 2009). The lack of parental involvement could also be why juvenile homicide offenders tend to suffer from illness. Their neglect, poor care and treatment, as well as potentially limited financial means, may contribute to their ill health (Hughes et al., 2009).

Violent family members is an understandable risk factor, as research has shown that abusive parents can lead to heightened aggression in children and a lower capacity to experience positive feelings (Bailey et al., 2001). Such violent families may also be prone to

criminality and, as Hughes et al. (2009) show, the juvenile homicide offenders in their study were raised in a climate of abuse, violence and criminality. By growing up in a family where violent and criminal behaviour are common, these children absorbed and integrated a model of violence. Anti-social acts are imitated and reinforced, both directly and indirectly, thus reducing the children's inhibitions. Additionally, these then-established behaviours persist due to positive reinforcement (Blackburn, 2002). When considering the risk factors discussed above, it is not surprising that contact with court was found in the systematic review to be a risk factor. These young offenders may come into contact with the courts as a result of their parents' actions, their own abuse, minor delinquency, or serious violent offences.

When taking into account the adversity in many juvenile homicide offenders' backgrounds, low academic achievement could be linked to low executive function, a lack of parental involvement, and being raised in an impoverished and/or risky environment. Such issues may influence the development of cumulative risk factors that eventually lead to these young people committing homicide.

Gang or group membership is a risk factor that, amongst others, increases the likelihood of either offending or becoming a victim. This is because members are exposed to situations, activities or belief systems that result in violence. The influence of peers in the gang or group, rivalry between gangs and groups, and criminality in which they are involved (e.g., drug trafficking), reinforces cohesion and social status amongst members (Papachristos, 2007).

Weapon possession and ease of access to firearms frequently features in studies on youth violence and juvenile homicide (DiCataldo & Everett, 2008) and, as such, this is not a surprising risk factor. Additionally, according to DiCataldo and Everett (2008), it may act as a facilitating environmental influence that affects the dynamic context of homicides.

The environment in which these young offenders are raised (e.g., family members involved in crime or violence) may have an impact on the system of beliefs they hold about crime. This is related to the theory of social learning (Bandura, 1986), where learning results from a combination of human interactions and environmental influences. By observing the behaviour of a parent who is involved in criminal activities, a young person may adopt this same behaviour if he or she sees positive and reinforcing consequences. Unless punitive consequences arise for the adult, there will be no deterrent for the young person to continue living on a criminal pathway. However, it is important to note that peers (and not family) might be role models that lead a youth towards a criminal career (e.g., peers who belong to gangs). Alternative pathways that do not result in criminality need to be shown to young people at risk.

7.1. Implications of the review

The review shows that juvenile homicide offenders are a heterogeneous group of people. The ten risk factors short-listed above are those most consistent across the current literature regarding juvenile homicide. This presents a platform for future research and the development of interventions to minimise the risk of lethal escalation in violence. The different themes regarding the risk factors indicate that early parenting interventions, with continual follow-up at school, would be beneficial in terms of managing and reducing families who are at risk.

Initiatives that support the development and education of young people in impoverished communities should be coupled with investigative teams that can recognise signs of neglect or abuse and can take action by providing the help required. Additionally, the risk factor relating to gender provides support for Roe-Sepowitz's (2009) suggestion that

male and female juvenile homicide offenders commit their offences for different reasons, and consequently require tailored assessment and treatment based on their gender.

7.2. Limitations and future research

The quality of the included studies varied, with some more prone to multiple biases than others, and some more detailed and comprehensive than others. This limitation is primarily due to the data quality in this particular research area. However, careful selection of control groups (either by random selection or matching the most important characteristics) and controlling confounding variables would assist with combatting selection bias.

The difficulty of defining juvenile homicide, as outlined in the introduction, presents limitations in that no study is directly comparable with another study. With no consistent definition, cases across the studies vary in terms of age of offender and offence actions. As no agreed international definition of juvenile homicide exists, reviews such as this that compare the findings of studies have to be read and interpreted with caution. Further, unless studied by the same team of collaborators (e.g., the cohort studies included in this review), the risk factors may be defined differently across the studies. Indeed, many studies did not specifically define each risk factor they measured (e.g., DiCataldo & Everett, 2008). Future research would benefit from an agreed set of definitions. Additionally, the consequences of adopting a restrictive data collection (case-control and cohort studies) might have missed the more infrequent characteristics displayed by some juvenile homicide offenders that would have been explained in depth in a single case study for example (see Kazdin, 1982).

The variety of comparison groups (e.g., non-violent offenders, violent offenders, and non-offenders) used across the studies presents another limitation. As each comparison group includes different sets of characteristics, it is not possible to make any generalisations about

the findings of the studies. As a result, a common theory regarding juvenile homicide offenders remains elusive.

Despite an exhaustive literature search, the majority of the good quality studies that were included here were from the USA (13 out of 16). There is a lack of research (or good quality research in some cases) on the topic of juvenile homicide offenders in the different European countries. It would be interesting to see how the risk factors found in European countries differ from those found in the USA (e.g., weapon possession). Future research should continue to explore the characteristics of juvenile homicide offenders in European countries when compared to control groups.

It is also unfortunate that some studies employed unstandardised measures, or alternatively did not provide sufficient information regarding the measures used. This resulted in a number of studies being excluded from the review. If more studies could have been included, added support for the identified risk factors could be established or new risk factors could be identified.

Despite the limitations, a number of avenues for future research are apparent. Cohort studies are a way forward, however they are not without their challenges (e.g., access to samples of juvenile homicide offenders and its low base rate, and the cost of longitudinal studies). If these challenges can be addressed, more cohort studies in this area of research would strengthen knowledge and understanding of this particular type of offender, and assist with developing appropriate interventions. In accordance with Heide's (2003) recommendations, enhanced methodological designs (e.g., the use of longitudinal designs) would be useful in understanding causal relationships and risk factors. Heide (2003) recommends enhancing existing knowledge by focusing on four distinct time frames: "the years preceding the homicide, the time period immediately following the homicide, the incarcerative or treatment period, and the postrelease period" (Heide, 2003, p. 25). This has

now begun to be implemented in a series of studies by Zagar et al. (2009a, 2009b).

Research that explores different types of juvenile homicide (e.g., parricide, gang-related homicide, and juvenile sexual homicide) would provide further insight regarding the different factors at play, motives and influences. It would also offer additional information that could assist with intervention and support prior to an offence being committed.

Future studies that consider risk factors relating to very young juvenile homicide offenders as opposed to older juvenile homicide offenders would assist with identifying children at risk. As the young offenders are at different places in the maturation process, it is likely different developmental factors will be present. If identified, these factors could assist with prevention and supporting those at risk.

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