

**Violence Risk in Forensic and Clinical Populations of Men and Women**

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## **Thesis Portfolio Abstract**

Violence against the person offences are on the rise in England and Wales. Violence is detrimental to both the physical and psychological wellbeing of the victim and the seriousness of this type of offence is likely to require a period of imprisonment, which is costly. Therefore, every measure should be taken to ensure public safety and prevent violence from initially occurring and, vitally, from occurring again when an individual is released from prison. This involves identifying the individuals at highest risk of violent reoffending, which requires understanding the risk factors that predict violent recidivism most accurately. This thesis uses systematic review methods to investigate and summarise the results of existing literature, first exploring violence in released prisoner samples, and then in samples of women specifically. Released prisoners as a whole have not been researched as frequently as select groups of individuals with mental health conditions or specific offending histories. This population contains small but growing numbers of women, who are currently risk assessed using instruments originally developed on men. This thesis explores the risk factors that predict violent reoffence in those released from prison, and the usefulness of a commonly implemented risk assessment tool when used with women. Results point to the importance of factors that can be modified with social or psychological interventions or treatment, however, methodological inconsistencies of the reviewed studies limit the conclusions that can be drawn. Implications of this are discussed and recommendations for clinical practice, policy, and research are made.

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I cannot write about violence at this time without acknowledging the tragedy in Palestine being witnessed around the world. I am so sorry for how severely Palestinians have been failed. I can only hope that a ceasefire is called soon and those both lost and still with us are treated with compassion and dignity.



## **Chapter One: Introduction to the Thesis Portfolio**

The police in England and Wales recorded over two million instances of violence against the person offences in 2022, an increase of 18% from 2021 (Winchester, 2023). Individuals who had received custodial sentences for violence against the person offences accounted for the highest proportion of prisoners in England and Wales in 2023 (Sturge, 2023). Hamby (2017) defines violence as behaviour that is intentional, unwanted, nonessential, and harmful. Douglas et al. (2013) further add that violence is a behaviour involving actual, attempted, or threatened bodily harm to another person. Bodily harm is clarified as meaning both physical and psychological harm, which they define as fear of physical injury, and other emotional, mental or cognitive consequences (Douglas et al., 2013).

Given this prevalent and adverse behaviour that has direct harmful implications to the physical and psychological wellbeing of the victim, it is no surprise that it has precipitated large amounts of research activity. Researchers, clinicians, and policy makers have turned to reviews and meta-analyses of the existing evidence to reliably identify and summarise findings (da Costa & Jüni, 2014) that may help to better understand and prevent violence. It has been especially necessary for research to focus on individuals with repeat offences of violence. Violent offences are more likely to receive custodial sentences (Sturge, 2023) and the cost of each individual residing in prison in the UK was estimated to be over £46k per year in 2022 (Clark, 2023). Having already spent large amounts of resources on imprisoning and rehabilitating these individuals, it is imperative that violent reoffending research continues to advance to inform ways to prevent it and its associated costs and harm.

According to the Risk component of the Risk Need Responsivity model (Andrews & Bonta, 2010), a framework which is backed by evidence on its effectiveness in reducing recidivism, preventing future reoffending requires accurately assessing risk that enables identification of the individuals most likely to engage in a reoffence so that interventions or management strategies, and their intensity of delivery, can be employed in a targeted way. Correctly identifying the individuals at highest risk requires identification of risk factors that have been found to be the most associated with or predictive of recidivism. Risk factors can be classified into static or dynamic categories. Static factors are demographic characteristics or historical factors that cannot be modified, whereas dynamic factors include psychosocial factors that have the potential to be changed. Modification of dynamic factors may lead to reduced risk and recidivism, while static factors may be useful in identifying individuals that require the greatest input and resources.

Previous reviews have shown that there may be differing sets of risk factors for different populations of individuals or types of offences. For example, recidivism in individuals who engage in repeated sexual offending has been associated with antisocial orientation, sexual preoccupation, and self-regulation problems (Hanson & Morton-Bourgon, 2019). Inpatients admitted to mental health hospitals have been found to be more likely to engage in violence during admission if they are male, have a diagnosis of schizophrenia, have previously had problems with alcohol, and have been violent before (Iozzino et al., 2015). It is usual for reviews like this to focus on subgroups of individuals or specific settings as any results can be pooled with as little heterogeneity as possible (Dekkers, 2018). This may also enable the development of interventions adapted for specific groups of individuals or the identification of gaps and future areas of study.

Despite benefits of reviews narrowing their focus to subpopulations, it may become difficult to generalise knowledge and findings to settings that serve diverse groups of individuals. Prisons for example house individuals of varied demographic characteristics and offending histories. It therefore becomes difficult to predict violent reoffending on release across this vast number of individuals using research that has focused on specific offences or populations. The first paper in this thesis will therefore systematically review and meta-analyse data from studies that have investigated the relationship between static and dynamic risk factors and violent recidivism on release in the under-researched but large, and potentially diverse, group of individuals who are released from prison. The first paper aims to identify the risk factors most predictive of violent recidivism when a person is released from prison.

While the studies reviewed were expected to represent a range of demographic characteristics and offending histories, statistics from the prison population in the UK show that in 2023, women comprised only 4% of the prison population (Sturge, 2023), which was reflected in the number of women included in the studies. Fewer but growing numbers of women in criminal justice systems relative to men have seen the empirical exploration of their risks and needs neglected by researchers (Hughes, 2005). Many of the models and theories of crime and violence have been informed by research on men and may therefore be inaccurate or ineffective when applied to women in the same way (Leote de Carvalho et al., 2023). A previous review of the literature argues that even the Risk Need Responsivity model, adopted widely to inform interventions for reducing reoffending, may be irrelevant to women (Messina & Esparza, 2022). There is therefore a need for risk assessment to be adapted to the information available about women.

Previous reviews on women's risk of violence have evaluated predictive validity of Structured Professional Judgement (SPJ) risk assessment instruments originally normed on male samples (Geraghty & Woodhams, 2015). The SPJ approach combines structured actuarial methods that sit at one end of the continuum, with unstructured clinical judgement on the other end. This allows practitioners to arrive at a summary conclusion of risk about an individual using both their clinical expertise and the structure of empirically derived risk factors relevant to the risk that the tool is measuring (Monahan & Skeem, 2014). The 20-item Historical-Clinical-Risk Management (HCR-20) is the most widely and commonly used SPJ instrument that assesses risk of violence in forensic and clinical settings such as prisons and inpatient mental health hospitals (Singh et al., 2014). Its most recent version was released in 2013 (Douglas et al., 2013) and is yet to be thoroughly evaluated on its use with women. This is important as reviews of its previous versions have found predictive accuracy for violent recidivism in women to be moderate and lower than predictive validity found for men (Rossdale et al., 2020). This has required a supplementary tool to be developed and used alongside the HCR-20, specifically for assessing women (The Female Additional Manual; de Vogel et al., 2012).

There is therefore a gap in the evidence of the use of the HCR-20 Version 3 with women, despite women being assessed with it currently (Rossdale et al., 2020). Without the evidence on whom and how the HCR-20 Version 3 can be implemented with women, the potential for risk to be miscalculated is high. This could lead to under- or over-estimating women's risk of violence, each having dire consequences on any victims of violence and the women themselves, who may be detained in more or less restrictive settings than is suitable to their real risk and needs (Wainstein, 2023). The second paper therefore will be a systematic review and narrative

synthesis of the studies that include samples of women who have been assessed with the HCR-20 Version 3. A narrative synthesis method was chosen as the review aims to describe the clinical and demographic characteristics of the women, the services they are using, and how the studies exploring the HCR-20 Version 3 with women have been conducted. A further aim is to synthesise and summarise the findings of these studies in order to make conclusions and recommendations that can be utilised by future researchers and clinicians.

I have opted to present the empirical meta-analysis first (Chapter Two) as this captures a wider population of individuals and is broader in focus. This will then be followed by a Bridging Chapter (Chapter Three) and the narrative review (Chapter Four). The narrative synthesis has a narrower focus of a specific risk assessment tool used with women exclusively. Chapter Five will provide a discussion and critical evaluation of the entire thesis, including conclusions and implications of both reviews.

## **Chapter Two: Systematic Review and Meta-Analysis**

Prepared for submission to *Trauma, Violence & Abuse*

(Author guidelines for manuscript preparation are provided in Appendix A)

# **Risk Factors for Violent Recidivism in Released Prisoners: A Systematic Review and Meta-Analysis**

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## **Conflict of Interest**

None.

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## Abstract

Violent reoffending remains a prevalent outcome that has costs for the victim and the state. Previous reviews have explored risk factors that predict general recidivism in specific offender subsamples, e.g. those with mental health conditions or sexual offending histories. However, risk factors for violent recidivism are likely to differ and have not been researched as frequently in individuals released from prison after a custodial sentence. This systematic review and meta-analysis therefore aims to identify the static and dynamic risk factors most associated with violent reoffending in released prisoners. Six databases and relevant review citations were searched, screened, and filtered, revealing 16 studies eligible for inclusion. Studies were included if they measured individual risk factors for violent recidivism in a general sample of released individuals and coefficients provided could be converted to odds ratios. Odds ratios of risk factors were pooled if reported similarly by two or more studies. Male sex, young age, criminal history, previous violence, education and employment difficulties, relationship problems, personality disorder, and criminal associates were found to be related to violent recidivism. Risk factors were measured by small numbers of heterogenous studies, however, limiting reliability and emphasising the need for additional research with consistent methodology investigating the general population of individuals released from prison. Limitations, implications, and recommendations are discussed.

**Key words:** violence; recidivism; risk factors; prisoners; systematic review; meta-analysis



## Introduction

Scotland, England, and Wales exhibit the highest imprisonment rates in Western Europe (Prison Reform Trust, 2021). Imprisonment in the UK serves various purposes, including public protection, punishment, rehabilitation, and crime prevention (Sentencing Act, 2020; Gauke, 2018; Beijersbergen, 2016). However, reoffending after release from prison is a common occurrence. The Bromley Briefing (Prison Reform Trust, 2021) reported that nearly half of adults (48%) released from prison become reconvicted of another offence within one year of release. The Ministry of Justice (MoJ, 2022) reported that between 2008 and 2020, the overall reoffending rate remained between 24% and 30%, with a quarter of those reoffending cases involving violent offences such as murder, attempted murder, and assault (Offence Classifications, 2010).

Reoffending in any form has significant negative implications at both the societal and individual levels. However, addressing violent reoffending is of particular importance since violent crimes have been found to inflict the most substantial losses on victims, second only to rape (Dolan et al., 2005), and violent offences are associated with greater likelihood of receiving a custodial sentence (Sentencing Council, 2022). Consequently, individuals with violent convictions comprise a significant proportion (70%) of detainees (Papalia et al., 2020). Economically and socially, reoffending by adults in the UK has been estimated to cost around £16.7 billion, with violent reoffending accounting for £4.2 billion of this total (Newton et al., 2019), which includes both physical and psychological costs to the victim. Beyond costs to society and victims, individuals with multiple convictions face additional obstacles to securing housing, employment, and financial opportunities, further contributing to existing disparities in economic and social

well-being (Hamilton & Fairfax-Columbo, 2022), and also reducing the state's revenue (Kantorowicz-Reznichenko, 2015).

There has been a range of literature considering the risk factors which are most important in predicting reoffending. Andrews et al. (2006) identified eight central factors that predict general recidivism – one ‘static’ factor (meaning it is fixed and cannot be changed) and seven ‘dynamic’, or modifiable, factors. These modifiable factors are found to have a stronger predictive power for reoffending (Eisenberg et al., 2019) and offer the greatest potential for interventions to target and improve with anticipated subsequent effect on reoffending. Nevertheless, it is equally important to identify and evaluate the predictive accuracy of static factors, which typically encompass an individual's history and sociodemographic characteristics. This is especially critical when investigating violent reoffending, which is likely to be predicted by a unique set of risk factors compared to general reoffending or other types of crimes (Oliver, 2011). This differentiation is supported by the development of separate risk assessment tools validated in predicting engagement in different types of offenses. Despite existing research, there remain challenges in accurately identifying the most important risk factors for violent recidivism, as the available literature varies in methodologies and populations studied (Viljoen et al., 2021). Researching and evidencing these factors would inform interventions to potentially reduce violence after release from prison.

General recidivism has been studied more widely and the Risk Need Responsivity (RNR) model (Andrews & Bonta, 2010) recommends interventions that are tailored to match an individual's level of risk, assessment of which is based on empirically derived risk factors and considerations. The implementation of this model and recommendations are associated with reductions in recidivism (Fritzon et

al., 2021; HM Inspectorate of Probation, 2020) and could be applied to violent recidivism. The RNR approach emphasises that those at highest risk of reoffending should be identified, treatments should be selected to target individual criminogenic needs, i.e. risk factors that are most predictive of recidivism for that person (Ward et al., 2007), and interventions should be adapted to the individual to make use of their strengths and learning needs to achieve desired outcomes (Andrews & Bonta, 2010).

Aligned with this model, psychological interventions in prison that target identified criminogenic needs have shown promise in reducing reoffending (Beaudry et al., 2021). Although the evidence base is limited by small sample sizes and methodology (Papalia et al., 2019; 2020), psychologists and psychological therapists play a crucial role in assessing and formulating risk and criminogenic needs. Clinical Psychologists are trained to deliver psychological therapies such as cognitive behavioural therapy, schema therapy, dialectical behaviour therapy, and motivational interviewing, which are associated with reduction in both general and violent reoffending among adults with violent offending histories (Papalia et al., 2019). In addition to evaluating, adapting, and developing these psychological interventions, Clinical Psychologists have the potential to influence policies aimed at addressing the underlying factors contributing to high crime and imprisonment rates, for instance, poverty and limited opportunities (Denney, 2019). Clinicians and policy makers alike therefore require additional research-based guidance to identify those at most risk of violent recidivism and target treatment efforts towards factors that are most likely to reduce this risk.

A meta-analysis conducted by Yukhnenko et al. (2019) found that dynamic factors such as employment problems, mental health needs, antisocial peers, substance misuse, marital status, and low income were predictive of recidivism in

individuals who were given community sentences. However, due to limited data, they were not able to analyse violent recidivism separately. Other meta-analyses have investigated violence following release, though this has been in subpopulations such as offenders with mental health conditions (Bonta et al., 2014), forensic outpatients (Eisenberg et al., 2019), youth offenders (Asscher et al., 2011), sex offenders (Hanson & Morton-Bourgon, 2019), or those with personality disorder (Yu et al., 2012). Goodley et al. (2021) meta-analysed samples of released adult prisoners with no identified mental health conditions. They found that previous incarcerations, rule violations, and holding pro-criminal attitudes were associated with general recidivism, which was the outcome of interest. In contrast to the results of Yukhnenko et al.'s (2019) review, Goodley et al. (2021) conclude that static risk factors were more predictive than dynamic risk factors in this population. However, neither have studied the (static or dynamic) risk factors for violent reoffending in those released from prison, which highlights a considerable gap in the literature.

### **Objectives**

This review focuses on violent recidivism, distinguishing it from other types of offences like sex crimes, theft, property damage, drug, and motoring offences. In addition, it aims to review the research involving the population of adults released from prison without narrowing the focus to subpopulations. Existing reviews have investigated subgroups of released offenders, however, none to date and to the knowledge of the authors, have extended their criteria to include a general diverse cohort of released prisoners with different offending backgrounds, who do not have a mental health condition. Having already spent resources on rehabilitating these offenders and preventing harm to any further victims, it is imperative to study and summarise the risk factors predictive of post-release violent reoffending to identify

targets for more effective intervention and continued prevention of this adverse outcome. The current review, therefore, aims to systematically review and meta-analyse available research to determine the static and dynamic risk factors for violent reoffending among released prisoners.

## **Methods**

### **Registration**

This study utilised a systematic review and meta-analysis design and was pre-registered on PROSPERO (CRD42022354034). PRISMA guidelines (Page et al., 2021) were followed (Figure 1).

### **Search Strategy**

A search of the databases PsycInfo, MEDLINE Ultimate, CINAHL Ultimate, PsycArticles, Scopus, and Web of Science was conducted on 12<sup>th</sup> October 2023 and updated on 18<sup>th</sup> March 2024 using the following search terms: ABS(recidiv\* OR “re-offen\*” OR reoffen\* OR rearrest\* OR “re-arrest\*” OR recall\* OR violat\* OR revocat\* OR reconvict\* OR “re-convict\*” OR arrest\* OR “new offen\*” OR "release failure\*" OR "post release" OR "postrelease") AND ABS(violen\* OR aggress\* OR assault\*) AND ALL(“risk assess\*”). Reference lists of relevant reviews were also scanned to identify additional studies.

### **Study Eligibility and Selection**

Studies were included if they:

- investigated risk factors in the general adult population (age 18 or above),
- contained data that enabled estimation of odds ratios for at least one risk factor,

- investigated individuals who were convicted and received custodial sentences before being released and followed up,
- used objective measures of violent recidivism, and were published since 1966 (in line with the time MEDLINE was established).

Selection was inclusive of both peer reviewed papers and unpublished dissertations or theses to reduce risk of publication bias.

Studies were excluded if they:

- investigated violent reoffending in adolescents (age 17 and under),
- investigated samples of a specific subpopulation (e.g. offenders with psychiatric diagnoses discharged from hospital or sex offenders released from prison),
- were cross-sectional or intervention studies,
- examined remand prisoners,
- investigated those who received community sentences only or those who had received convictions without custodial sentencing or incarceration,
- did not objectively measure violent recidivism or analyse separately any violent recidivism outcomes,
- were published before 1966,
- did not analyse and report predictive ability of individual items as risk factors of violent recidivism.

Studies were also excluded if their samples were derived from the same dataset of an included study, in which case the study with the largest or most relevant sample was included. Authors were contacted where studies provided coefficients

that could not be converted to odds ratios to check if another coefficient was available. Studies were excluded if authors were unable to provide this.

### **Definition of Violent Recidivism**

For the purposes of this review, violent recidivism was defined as violent offences that are committed by individuals following their release from prison, measured by at least rearrest. These offences include general violent acts towards another person as well as more specific types of violence (e.g. sexual assault). There was no distinction made on severity of violence or frequency. Examples of offences included are homicide, assault, wounding, and manslaughter. This contrasts with general recidivism, which may include non-contact offences such as theft, fraud, or traffic offences. Non-physical violence and aggression, such as threats of harm, were not included in the definition in this review. This definition is consistent with other reviews on violence (Fazel et al., 2018).

### **Data Extraction**

Study characteristics (publication year, country, length of follow-up, measured outcomes, selection dates), and sample characteristics (size, sex composition, mean age, reoffending rate) were extracted and recorded in a standardised Microsoft Excel form. Individual risk factors were extracted where they had been analysed for predictive ability or association with violent recidivism. Where multiple risk factors of similar description were reported by a single study, two authors (C.G. and L.F.) discussed and selected the most prevalent risk factor to ensure that each study only featured once in each domain. Author C.G. initially performed data extraction, which was cross-checked by author L.F.

Operationalisation, direction of effect, and source of information (e.g. records or risk assessment tool) were then recorded and checked for each risk factor. Risk factors determined to be similar in their variable types, descriptions, and direction of effect were grouped by domain (see Appendix C for descriptions of each risk domain). Some studies measured similar risk factors, however the way in which these variables had been collected differed in that some were scored based on presence or absence of the risk factor (dichotomous) or scored on a continuous scale (continuous). The two types of variables could not be combined and analysed as one domain, therefore requiring two separate domains. Risk factors were grouped into one domain if there were two or more of a similar description from at least two different studies. Risk factors that were measured and reported by only one study were excluded from analysis. Where there were inconsistencies in definition or measurement of risk factors, these were also excluded from analysis.

### **Statistical Analyses**

Where studies provided 2x2 data (the number of exposed vs. unexposed individuals and those who violently reoffended vs. did not reoffend), approximate odds ratios were calculated with associated 95% confidence intervals. However, few studies reported this data or odds ratios directly and most studies reported coefficients from regression or correlation analyses. Odds ratios were therefore converted from regression coefficients using the exponential function (Miller et al., 2001) and correlation coefficients were converted using online converters (Lin, 2020). Where reported effect sizes required conversion to odds ratios, 95% confidence intervals were calculated using Fisher's z-transformation (Glen, 2016) and standard errors (Bland, 2000). Initial calculations were performed by C.G. and L.F. cross-checked these to ensure accuracy of conversions. Some studies had



performed Kaplan-Meier or Cox regression survival analyses and provided hazard ratios, which were not possible to convert to odds ratios, and were therefore excluded. One study reported hazard ratios over a longer follow-up period (10 years), therefore, these were treated as approximately equivalent to odds ratios and included.

Once domains were established, each domain of risk factors was inputted into a separate Microsoft Excel spreadsheet that displayed the study name, sample size, odds ratio estimates, and upper and lower confidence intervals of each risk factor. Standard error, variance, and log odds ratios were calculated before pooling the log odds ratios and back-transforming to odds ratios during analysis using formulas reported by Zlodre and Fazel (2012). Random-effects meta-analyses were selected as heterogeneity was anticipated between the studies (Harrer et al., 2021). These were performed for each domain of risk factors, and accompanying forest plots were generated using the package metafor in R Version 4.3.2 for Windows (Viechtbauer, 2010; R Core Team, 2023). Each domain of risk factors was assessed for heterogeneity using prediction intervals, Cochran's Q statistic (Cochran, 1954), and I-squared ( $I^2$ ). The magnitude of Cochran's Q was assessed with the  $I^2$  statistic, which gives the percentage of variance due to between-study factors. Approximate interpretations of the  $I^2$  scores have been suggested as low for 25%, moderate for 50%, and high heterogeneity for 75% (Higgins et al., 2003).

### **Quality Appraisal**

The quality of studies was assessed using the Newcastle-Ottawa Quality Assessment Scale for cohort studies (NOQAS; Wells et al., 2014; see Appendix B). The NOQAS evaluates studies on their sample representativeness, selection, comparability, reliability of information sources, and adequacy of follow-up. Each

study was rated out of a maximum eight points instead of the original nine, as item four in the selection category was deemed inapplicable to the current study and was omitted. All studies were rated independently by author C.G. and 10 out of 16 were second rated by author E.J. Any disagreements on scoring the NOQAS criteria were discussed and resolved between authors.

## **Results**

### **Study Characteristics**

Sixteen studies met the inclusion criteria (see Figure 1 for screening and exclusion process), comprising a total of 371,693 (92% male) individuals from 16 independent samples. Two studies used women-only samples. Olson et al. (2016) provided data for men and women separately, however, only data for the sample of men were used as this was the largest sample. Studies were conducted across four countries, the majority from Canada or the USA. Six studies were unpublished dissertations or theses, and the remaining were peer-reviewed and published journal articles. Table 1 displays the study and sample characteristics. The included papers were published between 1996 and 2017, with dissertations and theses being completed between 1991 and 2011. Four studies did not specify the type of violent recidivism, however, retrieved this data from official records, indicating that rearrest may have occurred. The remaining studies operationalised violent recidivism as, at the very least, rearrest for violence after release from prison, data for which were retrieved from official records. The mean rate of violent recidivism across 15 studies that provided this was 17%, over an average follow-up duration of 3.6 years. Two studies did not report mean age, however the remaining samples ranged in mean age from 25.1 to 36.8 years old.

## **Meta-Analyses**

Extraction of all risk factors from each study yielded 30 distinct domains of risk factors, with each domain consisting of between two and six risk factors/studies. Table 2 displays each risk factor domain and summarises the random-effects meta-analyses results. Law (2004) did not have any risk factors that could be included in a domain due to measuring these factors categorically. Substance misuse items were reported separately for alcohol and drug use in some studies and so were divided into three domains (problems with substances, problems with alcohol, and problems with drugs). Risk factors for criminal history, associates, and previous violence were reported differently across the studies and therefore required separate domains for continuous and dichotomous measures. Age was measured and reported at first arrest by some studies and at release by others and was therefore separated into two domains. Out of 30 risk factor domains, 13 were estimated to be significantly associated with violent recidivism. Although planned to be completed post-hoc, subgroup analyses or publication bias tests were not deemed appropriate to perform as the number of studies in each risk factor domain being meta-analysed was fewer than 10, which would have compromised statistical power of these tests and rendered them inconclusive (Sterne et al., 2011).

## **Static Risk Factors**

Table 2 shows that younger age at first arrest, younger age at release; criminal history (both continuous and dichotomous groups); male sex; previous condition breach; previous violence (dichotomous group); and previous unauthorised leave were significantly associated with violent recidivism. Forest plots are provided for these static risk factor domains except for age at first arrest, criminal history (dichotomous group), male sex, previous violence (dichotomous group), and

unauthorised leave as these domains only comprised two or three risk factors each (see Figures 2-4). Significant heterogeneity was found among the risk factors of five of the nine static domains. Domains that were assessed to be without significant heterogeneity were young age at first arrest and young age at release, criminal history (dichotomous group), and unauthorised leave, indicating that these risk factors may be more consistently and robustly associated with higher odds of engaging in violent recidivism than not having these risk factors. Prediction intervals across these risk factor domains indicated that there was high dispersion in effect sizes and future studies investigating the same risk factors may find effect sizes that could span across a wide range (e.g. zero to large effect). The risk factors with the least amount of dispersion and narrowest prediction intervals were male sex and unauthorised leave.

### **Dynamic Risk Factors**

Criminal associates (continuous and dichotomous groups); personality disorder; problems with education or employment; and problems with relationships were significantly associated with violent recidivism (Table 2). Forest plots are provided for these dynamic risk factor domains except for personality disorder and associates (dichotomous group) as these domains only comprised two and three risk factors, respectively (see Figures 5-7). Analyses indicated that the odds of an individual with any of these risk factors engaging in violent recidivism post-release was higher than individuals without these risk factors. Significant heterogeneity was found among four out of the five domains, indicating potentially high variability between study cohorts, methodologies, outcome or risk factor definitions and measures. This may suggest that the effect of these risk factor domains on violent recidivism may not be consistent across samples, populations, and contexts.

Heterogeneity tests of the associates domain (continuous group) revealed a non-significant Cochrane's Q, however, this may be due to the smaller sample size within this domain which may have underpowered these tests. Prediction intervals across these risk factor domains demonstrated wide dispersion, indicating that future studies investigating these risk factors may find anywhere between zero and large effect size when predicting violent recidivism.

### **Quality Appraisal**

Table 1 shows that eight out of 16 studies received the maximum number of points (8/8). The remainder of the studies lost points, mainly for using volunteer (and therefore unrepresentative) samples, using self-report measures, or for not controlling for factors or assessing multicollinearity during analysis (Yoo et al., 2014), with the lowest rated study scoring 5/8 (see Table 1).

### **Discussion**

The objective of the current review was to systematically search the available literature and meta-analyse existing data to identify the risk factors associated with violent recidivism in individuals released from prison. Previous meta-analyses have investigated general reoffending, subgroups of individuals who have received community rather than custodial sentences, individuals with a mental health diagnosis, or those who have engaged in specific types of reoffence other than violence alone. Therefore, this is the first review that explores the population of individuals who have already served time in prison and been released before engaging in violent recidivism.

This review identified 13 groups of risk factors that were significantly associated with violent reoffence following release from prison. Among these risk

factors, being a man, having academic and employment difficulties, and relationship difficulties were found to double the likelihood of engaging in violence after incarceration. Associating with others who have criminal involvement was also found to be significantly related to violent recidivism. These findings are consistent with Yukhnenko et al.'s (2019) review which found that employment problems, marital status, and antisocial peers were associated with general recidivism, which included violent reoffences. Although, Goodley et al. (2021) found that holding pro-criminal attitudes, previous incarcerations, and rule violations were predictive of recidivism in released prisoners. Goodley et al.'s (2021) study outcome was general recidivism, however, and this may explain why the only similar risk factor for *violent* recidivism in this review was previous condition breach. With regards to previous incarcerations, while four of the included studies in this review measured this, only two were included in the analyses due to the other two measuring this factor inconsistently, which may have affected the strength of the association.

Similar inconsistencies were observed with other risk factors expected to be related to violent recidivism, which were not found to be associated in this review. For example, in individuals with mental health conditions, Bonta et al. (2014) and Eisenberg et al. (2019) found that substance misuse showed relation to violent recidivism. There were seven studies included in the current review that measured substance misuse. One was excluded due to measuring this variable categorically and the remaining six could not be analysed in one domain and required separating due to measuring substance, alcohol, and drug misuse separately. This left only four studies with factors in the problems with substances domain and two studies each in the problems with alcohol and drugs domains, which together with smaller sample sizes in these studies, may have reduced the strength of the effect.

Psychological/mental health problems and pro-criminal beliefs and attitudes were also anticipated to be related to violent recidivism, which was not found to be the case in this review. Previous studies of individuals with and without mental health diagnoses have shown significant effect of mental health problems and pro-criminal or antisocial attitudes/cognitions on post-release violence (Bonta et al., 2014; Eisenberg et al., 2019) and general recidivism (Gendreau et al., 1996; Goodley et al., 2021). However, the limited numbers of risk factors within the mental health domain may have weakened the pooled effect size. Seven studies in total measured factors related to psychological, emotional, or mental health problems, however only three were able to be grouped and included in analyses due to inconsistent measurements and definitions of the remaining factors. With regards to pro-criminal attitudes, there were four studies included in the analyses, which all had smaller samples. The largest effect size among them was at most moderate and they all lost at least one point during quality assessment. Therefore, the lack of significant effect of this factor may be due to the methodological limitations and significant heterogeneity across the studies and the reported effect sizes.

Heterogeneity was also high among most of the significantly associated risk factors. As expected, and corroborated by previous literature (Bonta et al., 1998), male sex, young age, criminal history, and previous violence were static factors that had significant effects on the outcome of post-release violence. Unauthorised leave and previous condition breach were also found to be significantly linked to violence after release from prison. The most homogenous factors were young age at both arrest and release, criminal history (dichotomous), and unauthorised leave, indicating that these factors were measured similarly across the studies and future research is likely to find similar results. The remaining risk factors were significantly

heterogeneous, however, and the criminal history (continuous) domain, which had the greatest number of studies of all the domains, had an  $I^2$  heterogeneity score of 100% when rounded up. While producing a combined significant effect, these studies were very diverse in their methodology, measurement, and definition of this risk factor or violent recidivism outcomes. This affects generalisability of these risk factors as prediction intervals suggest that effect sizes are likely to be variable in future studies.

Nonetheless, these static factors, that have been previously validated, may be of use to identify incarcerated individuals who are most at risk of future violence and direct more intensive interventions and strategies towards them. However, they do not inform the type of interventions or risk management strategies themselves. Identification of dynamic risk factors is therefore required to guide the development and selection of the interventions that are likely to lead to greatest change in these factors and subsequent risk. This review found that the dynamic factors significantly related to violent recidivism were personality disorder, associates who have also engaged in criminal behaviour, problems with education and employment, and problems with relationships. These factors, aside from associates (continuous), were also impacted by high heterogeneity, and prediction intervals warn that future studies may find no effect, which makes it difficult to draw any strong conclusions and make recommendations. This mainly highlights that more research is required that is methodologically more comparable to existing literature and uses similar designs, definitions, and measurements of risk factors and violent recidivism outcomes.

Despite this, based on the available data and this analysis, psychosocial interventions that target personality disorder, education and employment skills, and relationship skills may return the greatest reduction in violent recidivism following release from prison. In a survey across three-quarters of prisons and young offender



institutions in England, personality disorders were found to be highly prevalent at 17% nationally (Durcan, 2023). Although Dialectical Behaviour Therapy (DBT) was originally developed for people with borderline personality disorder, there is an emerging evidence-base surrounding the adaptation and use of DBT with individuals in forensic psychiatric or correctional settings and those who engage in aggression (Frazier & Vela, 2014; Mills et al., 2019; Tomlinson, 2018). The full DBT programme also supports the development and implementation of interpersonal effectiveness skills as well as emotion regulation training, which can be helpful for individuals who struggle to form and maintain healthy relationships (Linehan, 2015).

Where academic and work-related skills are concerned, unemployment among released prisoners is very high in England and Wales with only 10% entering employment after release (Webster et al., 2001). One review found that providing employment and programmes to individuals while still in prison was linked to reduced recidivism and increased likelihood in finding a job on release (Duwe et al., 2023). In addition, occupational therapy has been found to support rehabilitation in prison and improve individuals' life skills and meaningful occupation on release (Muñoz et al., 2020; Tilenni et al., 2020). The effectiveness of these interventions on reducing violent recidivism specifically has not been researched, however, emphasising the need for further investigation.

There is also something to be said about the social welfare system in the UK. Unemployed individuals' experiences were recently explored and a sense of the benefits and employment services in Britain being "punitive" and "criminalising" were found (Wright et al., 2020). Where there was a constant fear of loss of income, participants resorted to behaviour that paralleled that of incarcerated individuals. This suggests that similar patterns of behaviour may be being perpetuated by the

welfare system when an individual is released from prison and unable to find employment, making it more difficult to distance themselves from crime and associated volatile relationships and situations that could lead to violence.

### **Limitations**

All included studies were conducted in Western countries, predominantly in the United States and Canada. This may potentially overlook cultural nuances and variations in risk factors prevalent in other regions. This limitation underscores the need for more diverse and globally representative research as findings may not be applicable to other cultural or regional contexts, limiting the generalisability of the results. In addition, the findings of this meta-analysis may not fully represent the risk factors relevant to female released prisoners, as women constituted less than 10% of the total sample size. Therefore, caution should be exercised when generalising the results to this demographic group.

As many studies did not provide odds ratios as the effect size, these required pre-calculation prior to analyses, which may have introduced inaccuracies and odds ratios may therefore be approximations of the original effect size. Furthermore, the included studies varied greatly in sample characteristics, study designs, and measurement techniques of outcomes and risk factors, leading to high heterogeneity across several significant risk factors. This diversity may influence the reliability and generalisability of the pooled effect sizes and impact the ability to be conclusive regarding the risk factors found. Some studies employed inconsistent methods for measuring key risk factors, such as substance abuse and mental health problems, which resulted in their exclusion from the analyses. This left very few studies per risk factor domain and meant that tests of publication bias and subgroup analyses to explain potential reasons for heterogeneity were not possible. This impacts the

robustness of the findings and the strength of associations of what may otherwise be very important and relevant risk factors for violent recidivism (Borenstein, 2023). This links to a further limitation of studies only measuring a select number of well-researched risk factors, which limits exploration of other factors that may also be relevant to violent reoffending. Additionally, some studies included in the analysis had smaller sample sizes or lower methodological quality, which may have influenced the precision and reliability of effect estimates.

### **Conclusions and Clinical Implications**

The findings of this meta-analysis highlight several significant risk factors associated with violent recidivism among individuals released from prison. These fell into categories of static and demographic (male sex, young age, criminal history, previous violence) and dynamic and psychosocial (academic and employment difficulties, relationship problems, personality disorder, and criminal associates) risk factors. These latter factors, that may be most amenable to change, suggest possible interventions such as DBT, occupational therapy, and social policy changes that could be effective in reducing violent reoffending. This highlights the importance of exploring whether these interventions do indeed lead to reductions in violent recidivism. Such interventions also require collaboration between prisons, mental health services, social welfare agencies, and community-based organisations to address the wide needs of released prisoners, including education and training, employment, relationship difficulties, and personality disorder treatment identified by this review. Policymakers should target investments towards evidence-based interventions and strategies that address the identified risk factors for violent recidivism. Strategies aimed at promoting education and employment opportunities, strengthening social support networks, and addressing systemic barriers to

reintegration may contribute to long-term improvements in recidivism rates and, ultimately, community safety.

Despite these small but nonetheless important steps in understanding this population and this type of reoffence, it is essential to acknowledge the limitations identified in this review, including the underrepresentation of female prisoners, geographical skew towards Western countries, inconsistencies in measurement, small numbers of studies, narrow range of risk factors across these studies, and heterogeneity in included studies. These limitations emphasise the complexity of these issues, the potential difficulties in resources available for research that may influence the design and methodology of studies, and the need for more comparable and representative research to validate the identified risk factors and test out their effect on violent recidivism if they are successfully addressed and reduced. It is recommended that further research is undertaken on the general sample of released prisoners without narrowing criteria to selected subgroups of offences or populations to enable inclusion of a greater number of samples and risk factors in future reviews. Future studies should also utilise definitions and measurements of outcomes and risk factors that are consistent with existing research to allow future reviews to meta-analyse a larger number of similar risk factors. Finally, future studies should measure a wider range of risk factors that, when measured by multiple studies, could identify further areas of criminogenic need and treatment targets.

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## Tables

**Table 1**

*Summary of study and sample characteristics of included studies.*

<b>Study ID, Authors (year)</b>	<b>Country, Selection dates</b>	<b>Sample (% men), Mean age</b>	<b>Cohort</b>	<b>Type of violent recidivism, % who engaged in this</b>	<b>Duration of post-release follow-up</b>	<b>Quality rating</b>
1. Bonta et al. (1996)	Canada, 1983-1984	3267, 100%, 27.2	Incarcerated federal offenders	Reincarceration for violence, 19%	3 years	8/8
2. Chang et al. (2015)	Sweden, 2000	43840, 100%, not reported	Incarcerated offenders	Reconviction for violence, 25%	10 years	8/8
3. Helmus and Forrester (2017)	Canada, 2006-2008	8767, 94%, 35.3 <sup>1</sup>	Incarcerated federal offenders	Reincarceration for violence, 11%	5 years	8/8
4. Law (2004) <sup>2</sup>	Canada, 1999	497, 0%, 36.8	Incarcerated female federal offenders	Reconviction for violence, 4%	2 years	7/8
5. Loza and Loza-Fanous (2003)	Canada, not reported	305, 100%, 30.7	Incarcerated federal offenders	Unspecified violent recidivism, 18%	5 years	5/8
6. Mills et al. (2003)	Canada, not reported	209, 100%, 29.9	Incarcerated federal offenders	Unspecified violent recidivism, 21%	6 years	7/8

<sup>1</sup> Age at release

<sup>2</sup> Unpublished dissertation or thesis

<b>Study ID, Authors (year)</b>	<b>Country, Selection dates</b>	<b>Sample (% men), Mean age</b>	<b>Cohort</b>	<b>Type of violent recidivism, % who engaged in this</b>	<b>Duration of post-release follow-up</b>	<b>Quality rating</b>
7. Mills et al. (2004)	Canada, not reported	144, 100%, 34.5	Incarcerated offenders	Unspecified violent recidivism, 22%	4 years	6/8
8. Motiuk (1991) <sup>2</sup>	Canada, 1982-1985	510, 100%, 25.1	Incarcerated offenders	Unspecified violent recidivism, 15%	1 year	6/8
9. Nugent (2000) <sup>2</sup>	Canada, 1996-1998	125, 100%, 36.2	Incarcerated federal offenders	Reconviction for violence, 17%	2 years	7/8
10. Oliver (2011) <sup>2</sup>	USA, 1994	262530, 91%, 32.3	Incarcerated offenders	Rearrest for violence, not reported	3 years	8/8
11. Olson et al. (2016)	USA, 2007	23520, 100%, 33.3	Incarcerated offenders	Rearrest for violence, 30%	3 years	8/8
12. Polaschek et al. (2016)	New Zealand, 2010-2013	275, 100%, 32.0	Incarcerated offenders	Reconviction for violence, 18%	1 year	8/8
13. Rettinger (1998) <sup>2</sup>	Canada, 1991-1992	202, 0%, 29.7	Incarcerated female offenders	Reconviction for violence, 24%	5 years	6/8
14. Schwaner (2000)	USA, 1989	2263, 100%, not reported	Incarcerated offenders	Reincarceration for violence, 9%	3 years	8/8
15. St Amand (2003) <sup>2</sup>	Canada, not reported	232, 100%, 33.0	Incarcerated federal offenders	Reincarceration for violence, 8%	3 years	7/8
16. Zhang et al. (2014)	USA, 2006-2009	25009, 89%, 33.2 <sup>1</sup>	Incarcerated offenders	Rearrest for violence, 21%	2 years	8/8

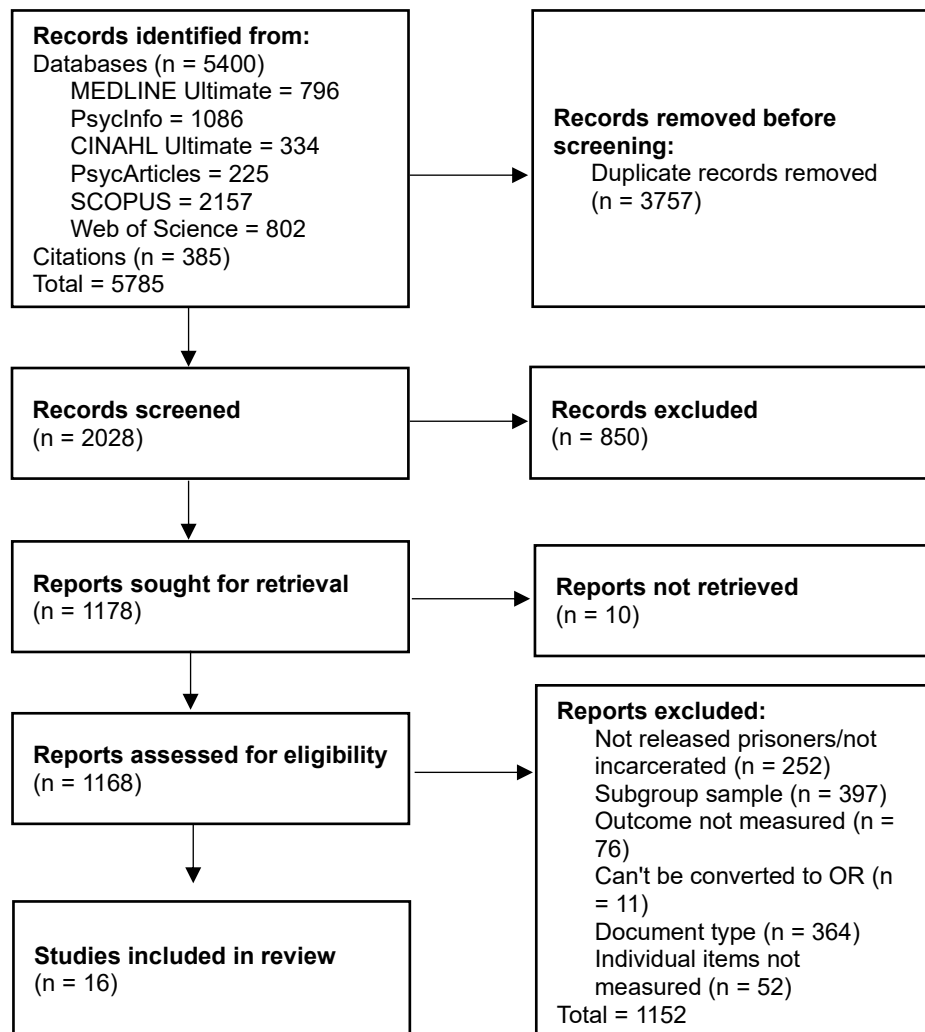
**Table 2***Random-effects meta-analysis of pooled odds ratios for each risk factor domain.*

<b>Risk factor domain</b>	<b>Variable type</b>	<b>k (Study ID)</b>	<b>n</b>	<b>Pooled OR</b>	<b>95% CI</b>	<b>I<sup>2</sup> (%)</b>	<b>Q</b>	<b>PI (lower-upper)</b>
Male Sex	Dichotomous	3 (2, 10, 11)	332904	2.37***	2.09-2.70	88	17.22**	1.86-3.02
Age At First Arrest	Continuous	3 (10, 12, 16)	287814	.97**	.95-.99	11	1.61	.95-.99
Age At Release	Continuous	4 (10, 11, 12, 16)	311334	.95***	.93-.97	12	5.35	.93-.97
Previous Incarceration	Dichotomous	2 (3, 11)	32287	1.69	.91-3.15	99	183.74***	.58-4.96
Criminal History	Continuous	6 (6, 8, 10, 12, 13, 16)	288735	1.61*	1.02-2.53	100	53.51***	.51-5.08
Criminal History	Dichotomous	2 (3, 5)	9072	1.70**	1.18-2.43	68	3.14	.96-3.00
Previous Violence	Continuous	2 (12, 15)	507	1.43	.86-2.37	59	2.46	.68-3.02
Previous Violence	Dichotomous	3 (3, 11, 14)	34550	1.56*	1.08-2.26	98	197.82***	.75-3.25
Non-Violent Offences	Continuous	2 (11, 15)	23752	1.01	.96-1.06	0	.00	.96-1.06
Drug Offences	Dichotomous	3 (3, 10, 11)	294817	.80	.55-1.18	100	733.64***	.37-1.72
Property Offences	Dichotomous	2 (10, 11)	286050	.76	.57-1.02	99	142.71***	.46-1.27
Other Offences	Dichotomous	2 (10, 11)	286050	.72	.45-1.13	100	339.16***	.33-1.58
Disciplinary Incidents	Dichotomous	2 (3, 11)	32287	1.48	.68-3.22	100	289.83***	.39-5.67
Unauthorised Leave	Dichotomous	2 (1, 3)	12034	1.55***	1.45-1.66	0	.43	1.45-1.66
Time Served	Continuous	3 (9, 10, 11)	286175	1.32	.72-2.43	100	1.86**	.41-4.27
Previous Community Supervision	Dichotomous	2 (3, 14)	11030	1.14	.70-1.85	97	33.93***	.49-2.63
Previous Condition Breach	Dichotomous	4 (1, 3, 10, 14)	276827	1.38**	1.11-1.71	97	86.06***	.86-2.22
Pro-Criminal Beliefs/Attitudes	Continuous	4 (6, 8, 13, 15)	1153	1.53	.86-2.72	85	17.57**	.46-5.08
Personality Disorder	Dichotomous	2 (2, 5)	44145	1.54*	1.01-2.34	76	4.12*	.78-3.03
Psychological/Mental Health Problems	Continuous	3 (6, 8, 13)	921	1.23	.73-2.05	75	8.53*	.49-3.09
Leisure	Continuous	3 (6, 8, 15)	951	1.09	.48-2.48	91	22.61***	.22-5.33

<b>Risk factor domain</b>	<b>Variable type</b>	<b>k (Study ID)</b>	<b>n</b>	<b>Pooled OR</b>	<b>95% CI</b>	<b>I<sup>2</sup></b>	<b>Q</b>	<b>PI (lower-upper)</b>
Problems With Education/Employment	Continuous	5 (6, 8, 9, 13, 15)	1275	2.04**	1.31-3.16	76	18.38**	.78-5.30
Problems With Finances	Continuous	4 (6, 8, 13, 15)	1153	1.48	.88-2.47	81	17.14**	.51-4.26
Problems With Accommodation	Continuous	4 (6, 8, 13, 15)	1153	1.14	.79-1.64	63	8.56*	.57-2.25
Associates	Continuous	4 (6, 7, 8, 13)	1065	1.64**	1.20-2.24	43	5.14	.98-2.74
Associates	Dichotomous	3 (5, 9, 11)	23949	1.62*	1.02-2.58	80	12.55**	.69-3.78
Problems With Relationships	Continuous	5 (6, 8, 9, 13, 15)	1278	2.01**	1.27-3.16	78	21.71**	.74-5.45
Problems With Substances	Continuous	4 (6, 8, 13, 15)	1153	1.40	.98-1.98	60	7.45	.74-2.65
Problems With Alcohol	Dichotomous	2 (2, 14)	46103	1.19	.79-1.78	96	26.75***	.59-2.38
Problems With Drugs	Dichotomous	2 (2, 14)	46103	1.22	.78-1.90	97	32.17***	.57-2.60

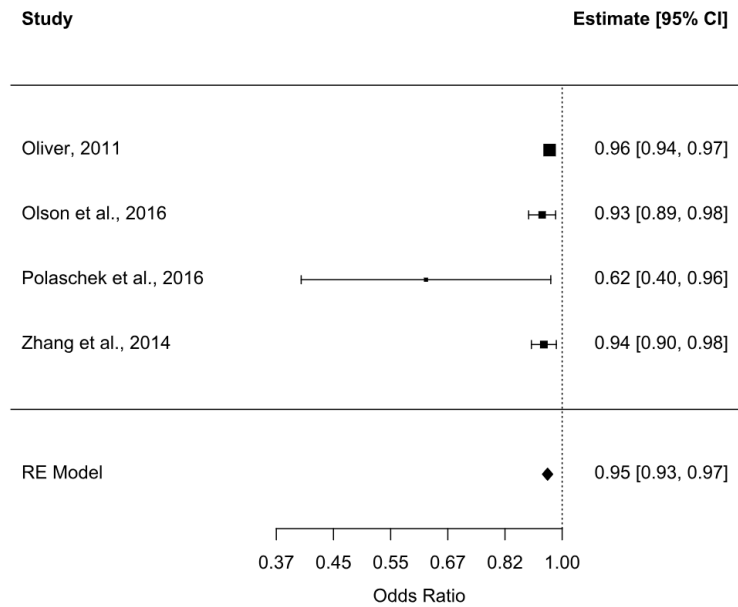
Note: \* =  $p < .05$ , \*\* =  $p < .005$ , \*\*\* =  $p < .0001$ ; k = number of studies in domain, OR = Odds Ratio; CI = Confidence Interval; I<sup>2</sup> = I-squared; Q = Cochran's Q statistic; PI = Prediction Interval

## Figures



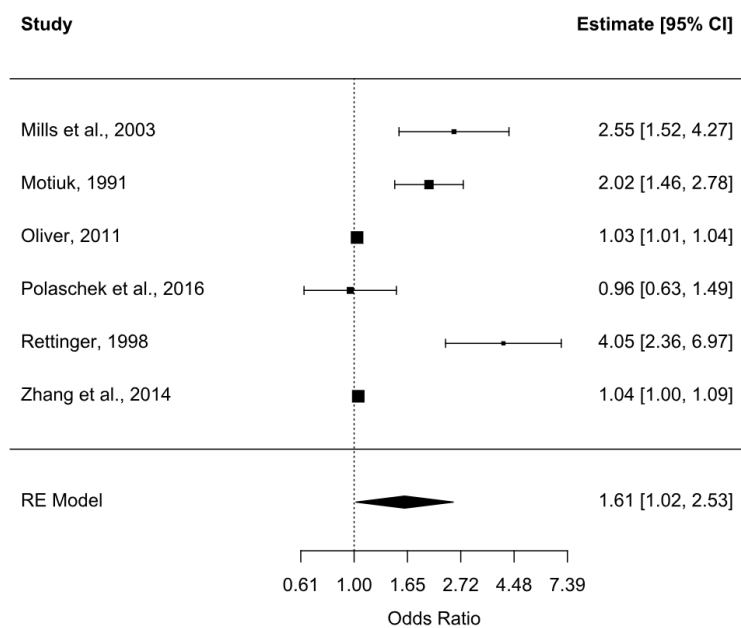
**Figure 1**

*PRISMA flowchart (Page et al., 2021).*



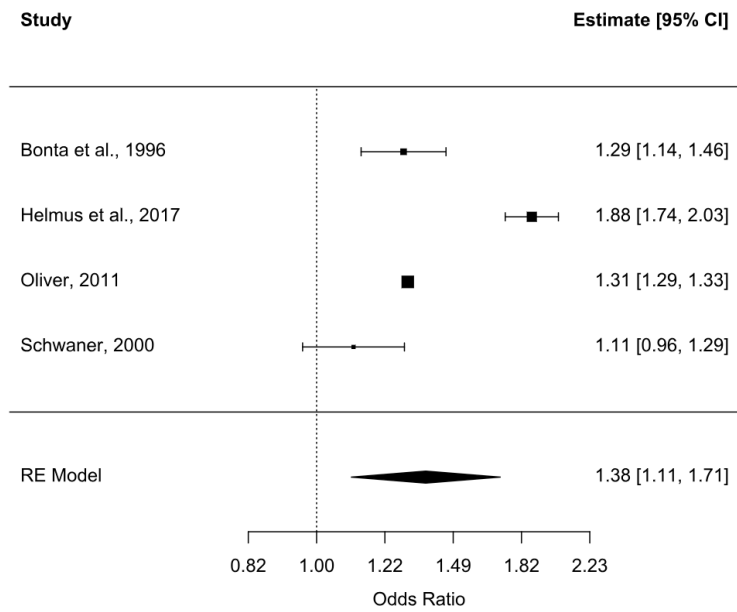
**Figure 2**

*Forest plot of pooled odds ratios for risk factor domain: age at release.*



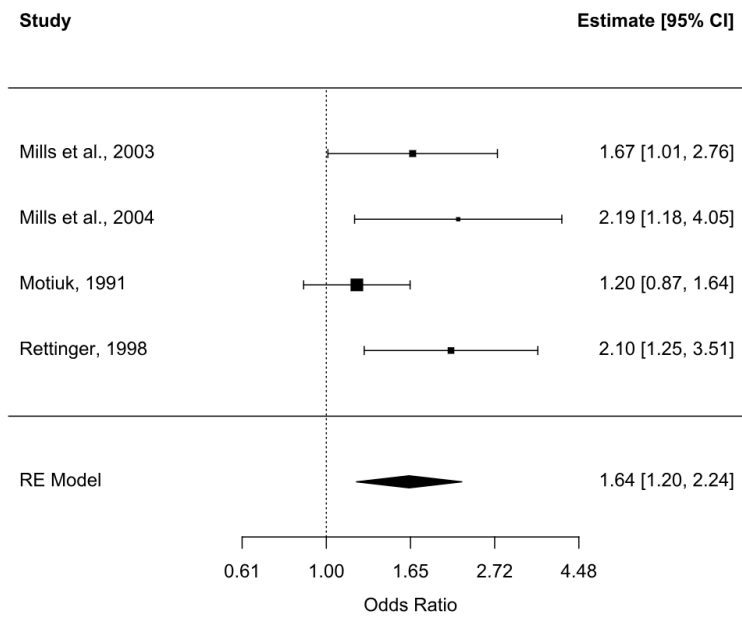
**Figure 3**

*Forest plot of pooled odds ratios for risk factor domain: criminal history (continuous).*



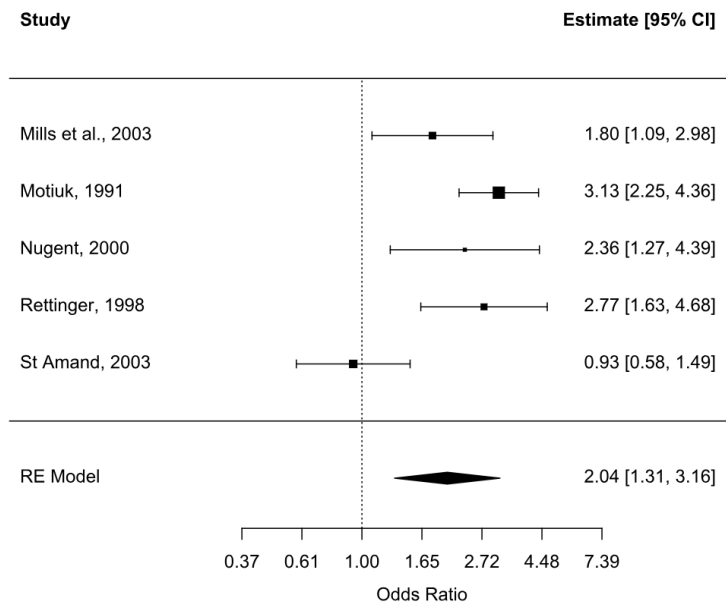
**Figure 4**

*Forest plot of pooled odds ratios for risk factor domain: previous condition breach.*



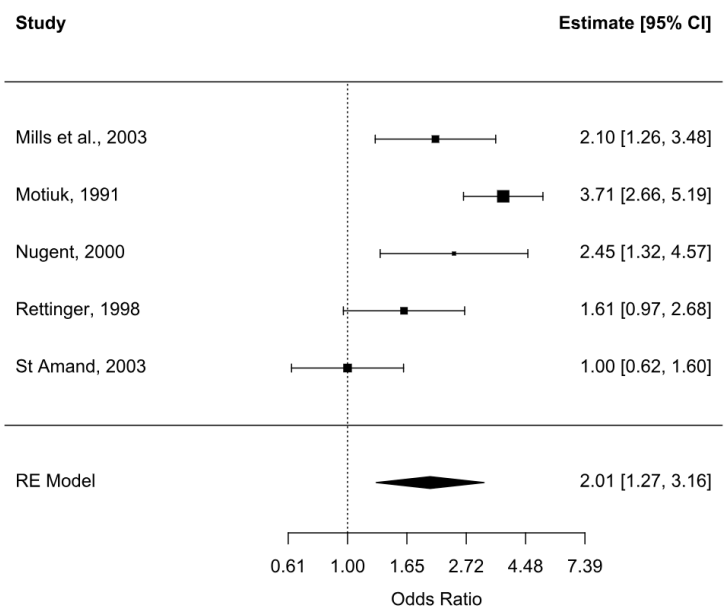
**Figure 5**

*Forest plot of pooled odds ratios for risk factor domain: associates (continuous).*



**Figure 6**

*Forest plot of pooled odds ratios for risk factor domain: problems with education/employment.*



**Figure 7**

*Forest plot of pooled odds ratios for risk factor domain: problems with relationships.*



### **Chapter Three: Bridging Chapter**

The previous chapter provided a systematic review of the available research and a meta-analysis of the pooled effect sizes that link risk factors with violent recidivism. The meta-analysis revealed a number of risk factors significantly associated with violent reoffending in individuals released from prison. These included static factors such as young age and criminal history, and dynamic factors such as problems with education or employment and problems with relationships. These findings may be able to inform future research, practice, and policy. For example, awareness of specific characteristics of released prisoners that are associated with violent recidivism could support more effective risk management and guide interventions. The included samples were comprised of a substantial male majority, which limits the generalisability of the findings. Existing risk assessment tools that capture some of these risk factors are also likely to be especially relevant for men, who risk assessment instruments have historically been validated on.

Due to smaller but growing numbers of women in criminal justice systems, risk assessment and violence is understudied in women. Despite this, risk assessment tools developed with men are being used currently with women without sufficient evidence of their predictive validity. The Historical-Clinical-Risk Management-20 Version 3 (HCR-20 V3; Douglas et al., 2013) is a widely used risk assessment tool for predicting violence. It has demonstrated its utility in assisting clinicians to assess and manage risk of violence in forensic and clinical settings. Although observed to be an improvement from its earlier version, there remains limited evidence of its usefulness for assessing violence risk in women and the characteristics of women who have been assessed with the HCR-20 V3. The following chapter will therefore systematically review the literature on women assessed with the HCR-20 V3 to

determine its utility and report the characteristics of the women it has been used and studied with. This is with the aim that it will allow clinicians to be better informed about the presentations and settings that the evidence is based on.

## **Chapter Four: Systematic Review and Narrative Synthesis**

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(Author guidelines for manuscript preparation are provided in Appendix D)

## Use of the HCR-20 Version 3 with Women: A Narrative Synthesis

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## **Abstract**

The Historical-Clinical-Risk Management-20 Version 3 (HCR-20 V3) is a commonly used violence risk assessment tool that has been insufficiently studied in women, despite the increasing number of females globally needing such assessments. Existing reviews exploring its predictive validity have not focused on women and there is limited information on women's characteristics and clinical presentations, which creates challenges for clinicians utilising the tool to assess and manage risk. Therefore, this systematic review and narrative synthesis aims to explore the profiles of women assessed with HCR-20 V3 and the contexts in which the tool is used with women. A search of five databases identified 11 studies that met the inclusion criteria, totalling 445 women. Studies were mainly conducted in inpatient psychiatric settings, in predominantly Western countries, with women that had schizophrenia spectrum, substance misuse, and personality disorders, whose mean age was above 30 years old. The Clinical scale of the HCR-20 V3 was found to be most predictive of future violence in women. The Female Additional Manual (FAM) weakened predictive validity. The studies varied in their methods and used small samples of women. Limitations and implications are discussed and recommendations for future research and practice are made.

**Key words:** risk assessment; risk factors; mental health; women; review

## 1. Introduction

Individuals detained in forensic and clinical settings, such as prisons or secure hospitals, are often done so for a range of purposes, with public safety and prevention of harm from violence being a major one (Yasrebi-De Kom et al., 2022). Given its substantial estimated global cost and often devastating physical and psychological impact (Iqbal et al., 2021), clinicians, institutions, and policy makers have worked towards reducing and protecting society from the harm inflicted by violence, both within institutions and outside (Carpiniello et al., 2020). With this in mind, a range of structured professional judgement (SPJ) instruments, that combine both clinical judgement of professionals and risk assessment items derived from empirical research, have been developed to aid the prediction of violence and improve its accuracy relative to unstructured professional judgement and actuarial methods employed in the past (Douglas & Kropp, 2002; Douglas & Webster, 1999).

One such instrument developed for the assessment and management of violence risk is the Historical-Clinical-Risk Management-20 Version 3 (HCR-20 V3; Douglas et al., 2013). This is the most recent and updated version of the tool, comprising 10 Historical, five Clinical, and five Risk Management items found to be associated with future violence in those in forensic or mental health services (Guy et al., 2013). The Historical scale covers historical and static (or unchanging), items and the Clinical and Risk Management scales capture recent or future dynamic (or modifiable) items. Each item is then scored on a three-point scale (0 = not present/relevant, 1 = partially present/relevant, 2 = present/relevant), pertaining to whether or not the item is present for the individual and relevant to their risk of violence. Prior to the introduction of V3,

items were only rated for presence, not relevance. A final summary risk judgement is made regarding the severity and imminence of future violence risk posed by the individual based on the information collected and reviewed.

Version 2 of the HCR-20 (V2; Webster et al., 1997) and its subscales have been repeatedly evaluated for predictive validity, which has since been established across a range of populations and settings (Guy & Wilson, 2007). V2 has become the most commonly implemented violence risk assessment tool across five continents (Singh et al., 2014). However, the release of V3 in 2013 introduced additional measures to manage risk as part of the assessment process, such as amendments to the items, relevance ratings of risk factors, risk formulation, scenario planning, and risk management planning (Douglas, 2014). It is likely that many institutions have begun to adopt the newest version of the HCR-20 (Logan, 2014), which makes it important to thoroughly research its utility and impact on risk assessment and management of individuals in both clinical and forensic settings.

Accurate and meaningful approaches to the identification of individuals who are most at risk of engaging in violence and those who would benefit most from intervention is of great consequence as it reveals targets and priorities for investment of finite resources and treatments to curb this adverse event (Whiting et al., 2021). This is in line with the Risk Need Responsivity (RNR) model (Andrews & Bonta, 2010) and SPJ approaches (de Vogel et al., 2022), which stipulate that risk assessment should be individualised and enable risk management that is tailored to the unique needs of the person being assessed and treated, to prevent adverse behaviours. Despite these guidelines, research with women, who are believed to have differential criminogenic needs to men (de

Vogel et al., 2019), has been neglected (Hughes, 2005). This is also true of other fields, for example in medicine where women are disadvantaged by the limited medical advancements and understanding of their specific health needs (Merone et al., 2022). However, it is arguably even more of an issue in the forensic context given that the large over-representation of males in the criminal justice system means that research often excludes, or only partially represents, the female population (Clark, 2023). This has detrimental consequences in forensic and clinical domains, to both society, where female-perpetrated violence remains a risk, and to the women themselves who are usually detained under restrictive measures that compromise their wellbeing and quality of life (Tully et al., 2023).

Women made up around 4% of those imprisoned in England and Wales in 2023, which was an increase from the previous year (Clark, 2023). Women in secure hospitals are as likely to perpetrate violence as men and engage in inpatient aggression more often than men (Jeandarme et al., 2017; Lieser & Rossdale, 2023). However, despite these findings and growing numbers of women in criminal justice systems internationally (Institute for Criminal Policy Research, 2022), most of what is known about the violence risk assessment and the utility of instruments such as the HCR-20 is informed by predominantly male samples (Gower et al., 2020). It is therefore unsurprising that studies employing women-only samples assessed with the HCR-20 V2 typically report lower predictive validity (Ogonah et al., 2023).

As a solution to this, the Female Additional Manual (FAM; de Vogel et al., 2012) was developed to supplement the HCR-20 V2 when assessing women in forensic settings. It proposes that factors such as intimate partner violence, prostitution, pregnancy at a young age, parenting difficulties, and self-harm must



be considered in addition to the 20 items assessed in men when predicting risk of violence in women. However, when the HCR-20 V2 has been supplemented with the FAM in women-only samples, the predictive validity remains lower than when the HCR-20 V3 is used alone (Ogonah et al., 2023). This suggests that the V3 amendments to the HCR-20 may have improved violence risk assessment for women, although this has not been replicated with larger or more diverse female samples.

Consistent with RNR and SPJ approaches, it is possible that the addition of risk formulation to the HCR-20 as well as assessing risk within contextual scenarios related to the individual's risk may have contributed to the improvement in risk prediction in women (de Vogel et al., 2022). Risk formulation involves combining theory and empirically derived risk factors into a narrative that explains an individual's current difficulties in the context of their history and provides targets for modification of the factors that maintain these difficulties and risks (Tarpey et al., 2023). Especially in circumstances where individuals are non-responsive to risk reduction interventions and their cases are deemed complex, formulation can support professionals in more holistic and person-centred decision-making regarding risk, restrictions, and treatment (Franke & Dudeck, 2019; Tarpey et al., 2023).

Risk assessment and formulation with the HCR-20 may achieve the desired outcome of violence reduction by informing treatment or risk management practices or by communicating complex and sensitive information to enable individuals and teams to co-formulate difficulties and challenges (The British Psychological Society [BPS], 2017). However, further information about the women requiring risk assessment and management interventions, their

presentations, characteristics, and the settings and contexts that these needs arise in are required. In addition, it is inaccurate and ineffective to categorise all women in secure or mental health services within the same group. Understanding of women and their risk factors requires attention to the personal social and demographic characteristics that may intersect and compound risk, such as age, ethnicity, economic background, mental health needs, etc. (Montford & Hannah-Moffat, 2021).

Existing reviews have explored predictive validity of the HCR-20 V2 in women (O'Shea et al., 2013; Gower et al., 2020; Geraghty & Woodhams, 2015). Reviews that have expanded their inclusion to the predictive validity of the HCR-20 V3 either did not mention women in the samples (Challinor et al., 2021) or were only able to retrieve two studies of women assessed with V3, with little information about the characteristics of these women (Rossdale et al., 2020). Although it is essential to evaluate whether a tool can accurately predict the level of risk an individual poses and provide directions for reducing risk, clinicians must additionally be informed as to whether a tool is suitable for use with specific profiles, presentations, or settings. When selecting an instrument, clinicians should be supported by research that provides details about the individuals on whom studies assessing predictive validity have been conducted. Women's needs and circumstances may vary by ethnicity, age, or other factors, and the responses of clinicians and practitioners could be adapted accordingly to work with women in their care more effectively (S. W. Smith et al., 2020).

Despite the HCR-20 V3 being released 10 years ago, there are no reviews currently that summarise and describe the characteristics of women assessed with it, the types of studies that have investigated them, or the settings that this

research took place in. Since the publication of Rossdale et al.'s (2020) review, which examined studies of women assessed with all versions of the HCR-20, it is possible that new papers may be available that could elucidate and characterise the women the HCR-20 V3 specifically has been implemented with.

The current review therefore aims to build an understanding of the profiles of women assessed with the HCR-20 V3 using reported individual characteristics and clinical presentations. It is anticipated that this will provide clinicians and practitioners with a relevant, recent, and clearer evidence base to make decisions about the generalisability of findings to the specific populations of women in their care, the suitability of using the HCR-20 V3 with these individuals, and the considerations that may be required when using the HCR-20 V3 in practice. It is anticipated that this will subsequently improve the outcomes of women by enabling a more accurate and informative risk assessment, which increases the likelihood of improved, individualised risk management strategies that are least restrictive and most effective for the individual's goals, treatment, and care. A second objective of this paper is to build understanding of the types of studies, settings, and facilities that HCR-20 V3 is used in with women to enable clinicians to determine whether using the HCR-20 V3 is suitable within the specific setting in which they practice. Additionally, this paper aimed to also review and report findings of studies that have employed the HCR-20 V3 with women.

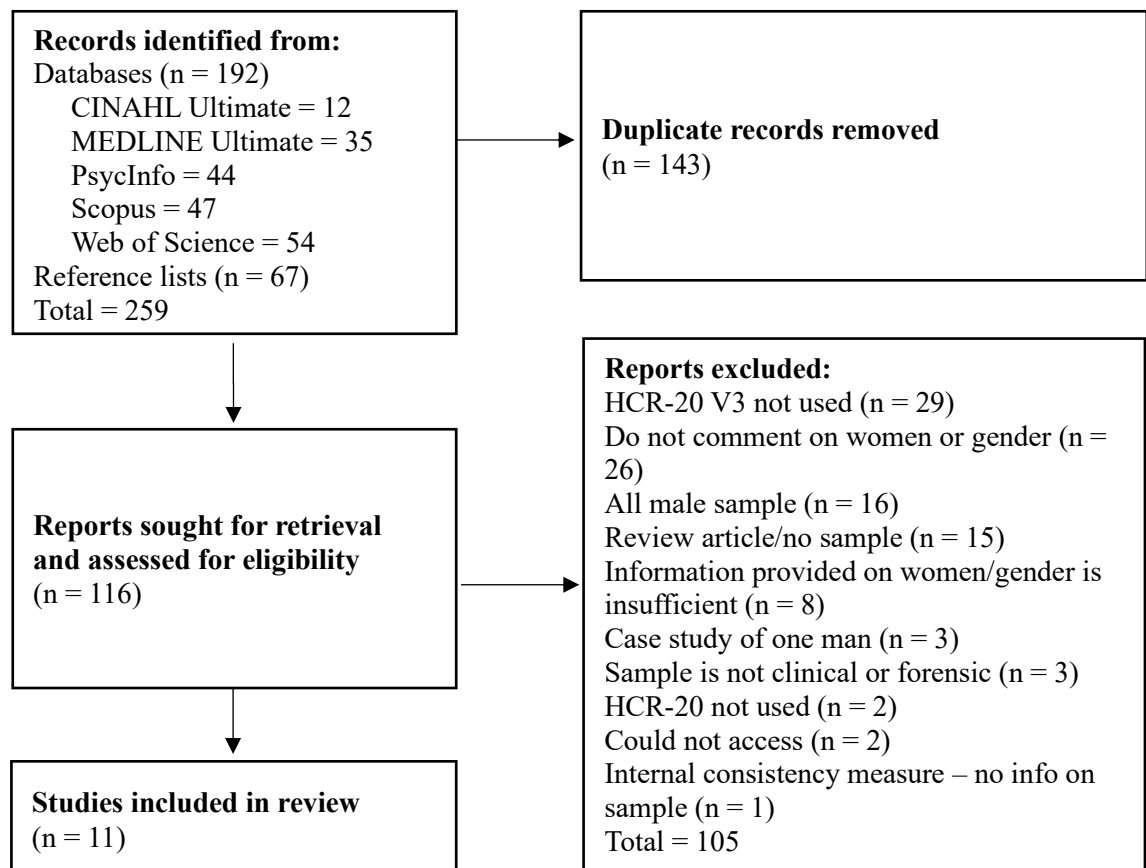
## 2. Methods

### 2.1 Design

A narrative synthesis design was selected for this review as it was best suited to the aims of exploring and describing the lesser investigated characteristics of women assessed with the HCR-20 V3.

### 2.2 Registration

The current study utilised a systematic review and narrative synthesis design. Therefore, the review protocol was pre-registered in PROSPERO (CRD42023476561) and 2020 PRISMA guidelines (Page et al., 2021) were followed (Figure 1).



**Figure 1**

*PRISMA flowchart (Page et al., 2021)*

### **2.3 Search Strategy**

A search of the databases PsycInfo, MEDLINE Ultimate, CINAHL Ultimate, Scopus, and Web of Science was conducted on 9<sup>th</sup> December 2023 using the following search terms: ABS(“Historic\* Clinical Risk” OR “Historic\* Clinical Risk Management” OR “HCR-20” OR “HCR-20V3”) AND ABS(“Version 3” OR “V3”). Reference lists of relevant reviews and papers were also scanned to identify additional studies and full texts were retrieved of research published in 2013 or later, as this is when the HCR-20 V3 was released. Similar to Rossdale et al. (2020), search terms did not include “females” or “women” so as not to narrow the results or exclude mixed samples where women may have been included or discussed outside of the abstracts searched.

### **2.4 Study Eligibility and Selection**

Studies were included if: they were published research studies that have used the HCR-20 V3 in adult samples (aged 18 and over); their samples included women and these individuals were discussed separately to any men, or data was available for women separate to any men; they were conducted in any type of setting, including facilities such as forensic hospitals, prisons, or community settings; they were cross-sectional, longitudinal, cohort, case-control, retrospective, or prospective studies.

Studies were excluded if: they did not use the HCR-20 V3 to assess women; samples were of children or adolescents (aged 17 or under); samples were of only men; samples included a mix of men and women without commenting on the subsample of women or reporting any data on women separate to the men; they were review or opinion papers. As the HCR-20 V3 was released in 2013, relevant papers published prior to 2013 were still screened before being excluded.

## 2.5 Data Extraction

Study characteristics (e.g. country, sample size, population and setting, type of study, how the HCR-20 V3 had been used and rated, outcome measures), sample characteristics (e.g. age, ethnicity, clinical presentations or mental health conditions, previous offending and index offence, Mental Health Act or forensic status, other characteristics), and key findings (e.g. the profiles of women that the HCR-20 is being used with, the ability of the HCR-20 V3 in predicting violence and other outcomes in women compared to men, how the HCR-20 V3 performed compared to other instruments, the clinical utility of using the HCR-20 V3 with women in the sample) were extracted.

Where multiple time points were provided, mean age was extracted at index offence or admission rather than on assessment or discharge as this was the most frequently reported among the included studies. As different countries used different mental health legislation and criminal justice systems, the sections that individuals were detained under were considered forensic if they were court-ordered following an offence or the individuals were transferred to or from prison prior to or following hospital treatment. For studies that did not give the mean age of the subsample of women, this was estimated using the weighted average from the size of the sample of women and age ranges when these were provided. The most frequently reported effect size for predictive validity was Area Under the Curve (AUC), and this was extracted for each subscale of the HCR-20 V3, where provided. Where correlation coefficients were provided, an online effect size converter was used to estimate AUCs (Lin, 2020). One study (Campbell & Beech, 2018) reported negative binomial regression beta coefficients which were not possible to convert to AUC estimates.

Another study reported chi-square coefficients which were also not able to be converted to AUCs (Crabtree, 2019).

## **2.6 Quality Appraisal**

The quality of studies was assessed using the JBI Checklist for Cohort Studies (Moola et al., 2020; see Appendix E). The JBI Checklist evaluates the methodological quality of a study to determine the extent to which it has addressed the possibility of bias in its design, conduct, or analysis (Moola et al., 2020). Each study received a rating out of a maximum of seven points, as items one, two, six, and 10 were deemed inapplicable to the included studies and were omitted. Although other tools were considered, they also contained items that were not applicable to all the studies included in this review, and the JBI was therefore selected. All studies were rated independently by author C.G. and five were second-rated by author L.F. The authors addressed and resolved any uncertainties concerning the application of the JBI criteria to the studies included.

## **3. Results**

### **3.1 Search Results**

Of the 116 records retrieved for review, 45 included women (Figure 1). Among these studies, there was a general trend of not reporting outcomes or conducting analyses of women's data separately to the men's. Some studies did not provide descriptive or demographic information for the women in their samples or explore or summarise any findings pertaining to similarities or differences between the men and women. Thirty-four studies that included women were therefore excluded, in addition to 71 other studies that did not meet the inclusion criteria. Eleven studies remained that met the inclusion criteria, totalling 445 women across the 11 samples. One study was a dissertation (Crabtree, 2019) and the remainder

were peer-reviewed and published journal articles. The 11 studies were conducted across 8 different countries. Six of these studies included men and women and, although five of these contained limited information and conclusions regarding the women in the sample, they remained useful to include as study context, population, and setting could be extracted. Just under 60% of the total sample across the 11 included studies were women.

### **3.2 Quality Appraisal**

Quality appraisal ratings are provided in Table 1. One study was not able to be given a rating as it was a single case study and the JBI items did not correspond well with its design. It was subsequently excluded from quality appraisal. Due to the variability of study designs, some leaned themselves better to the JBI criteria than others. For example, two studies did not measure an outcome or conduct any analysis that the JBI asks about. For these studies, quality appraisal was still completed as interpretation could be made within the wider context of the overall results. Ten studies in total were given a rating between three and seven out of seven, with most of them receiving a rating of five. All studies that lost points did so due to not specifying whether confounding factors were identified, or which strategies were used to deal with them during analysis. The two studies that were given a rating of three out of seven also lost points due to not measuring or reporting follow-up. The JBI does not provide cut-offs regarding quality ratings (Moola et al., 2020) and no studies were excluded from this review based on their quality rating or inability of the tool to assess their quality.

### **3.3 Study Characteristics**

Table 1 presents features of each study (country, setting, type of study, outcomes, follow-up, instruments evaluated) and provides descriptive data about the



studies (size, race or ethnicity, and mean age of the samples). Five studies did not provide information about the ethnicity of the sample or did not provide this separately for the subsample of women. Three studies did not provide the mean age for the women in their sample. The average ages of the remaining eight samples were observed to be older than 30 years. However, the age that was used by the eight studies differed between age at index offence (Green et al., 2016), age at admission (de Vogel et al., 2019; Sorge et al., 2022; Wolf et al., 2023), age at assessment (Campbell & Beech, 2018; Chen et al., 2023), or unspecified (Chester et al., 2019; Lieser et al., 2023).

Studies mainly utilised a retrospective design where case files were used to score the HCR-20 V3 for research purposes. Three studies did not investigate predictive validity or outcomes following assessment with the HCR-20 V3. The other eight studies primarily measured violence as an outcome, followed by recidivism and self-harm. These studies varied in the length of time they followed patients after assessment, ranging from six months to 12 years. This, as well as the type of violent outcome measured, may have resulted in the percentages of women who engaged in the outcomes differing substantially between studies, with rates of institutional violence, for example, ranging from 22% to 74%.

Mainly Western countries were represented in this review. The HCR-20 V3 was officially translated for use by researchers in China (Chen et al., 2023), Germany (Wolf et al., 2023), and Italy (Sorge et al., 2022) and then used to assess the individuals in each study. Four studies utilised the HCR-20 V3 with the FAM (Campbell & Beech, 2018; de Vogel et al., 2019; Lieser et al., 2023; Wolf et al., 2023), and two studies with the Level of Service Inventory (LSI; Crabtree, 2019;

Sorge et al., 2022). Nine of the 11 studies used data from individuals residing in an inpatient forensic psychiatric setting.

**Table 3***Characteristics of the included studies.*

<b>Study, Country</b>	<b>Sample, n (% Women), Mean age (range), Ethnicity</b>	<b>Type of study</b>	<b>Population, Setting</b>	<b>Instrument(s) studied</b>	<b>How HCR-20 V3 was used, Rater</b>	<b>Quality rating</b>
<b>Campbell and Beech (2018), UK</b>	89 (100%), 35 <sup>3</sup> , 51% Caucasian, 6% Black, 2% Asian, 1% Mixed	Prospective cohort study measuring predictive validity of HCR-20 V3	Psychiatric inpatients, Private secure forensic psychiatric hospital	HCR-20 V3, FAM	Routine clinical practice, Clinical team	5/7
<b>Chen et al. (2023), China</b>	152, 58 (38%), 48 (25-75), 100% Chinese	Prospective cohort study comparing men and women, civil patients and offenders, and predictive validity of the HCR-20 V3 and VRS	Offenders with mental disorders and civil psychiatric patients, Prisons/psychiatric hospitals	HCR-20 V3 (Chinese edition), VRS	Research purposes, Forensic psychology graduate research assistants	7/7
<b>Cheng et al. (2019), Canada</b>	32, 6 (19%) <sup>1, 4, 5</sup>	Retrospective cohort design evaluating how HCR-20 V3 items predict final risk formulations	Not criminally responsible (NCR) on account of mental disorder inpatients under warrant, Forensic psychiatric hospital	HCR-20 V3	Research purposes, Trained psychologists and senior undergraduate students	3/7
<b>Chester et al. (2019), UK</b>	84, 34 (41%), 32 (18-57) <sup>3</sup>	Retrospective study examining the age at which antisocial or violent behaviour was first exhibited	Inpatients with intellectual disability, Forensic intellectual disability inpatient service	HCR-20 V3	Routine clinical practice, Clinicians	3/7

<sup>3</sup> Age ranges not provided or not provided separately for women<sup>4</sup> Mean age not provided or not provided separately for women<sup>5</sup> Ethnicity or race not provided or not provided separately for women

<b>Study, Country</b>	<b>Sample, n (% Women), Mean age (range), Ethnicity</b>	<b>Type of study</b>	<b>Population, Setting</b>	<b>Instrument(s) studied</b>	<b>How HCR-20 V3 was used, Rater</b>	<b>Quality rating</b>
<b>Crabtree (2019), USA</b>	18, 6 (33%) <sup>1, 2, 3</sup>	Longitudinal follow-up study comparing the predicted risk of recidivism between three tools	Clients diagnosed with a serious mental illness who have committed felony offences, Community mental health clinic	HCR-20 V3, LSI-R, IORNS	Research purposes, Graduate student	5/7
<b>de Vogel et al. (2019), The Netherlands</b>	78 (100%), 34 (20-65), 87% Caucasian	Retrospective follow-up study assessing predictive validity of HCR-20 V3	Forensic psychiatric inpatients, Forensic psychiatric hospitals	HCR-20 V3, HCR-20 V2, FAM, PCL-R, START, SAPROF	Research purposes, Trained and experienced psychologists and criminologists	5/7
<b>Green et al. (2016), USA</b>	124, 24 (19%), 33 <sup>1</sup> , 21% Caucasian, 38% Black, 21% Hispanic, 17% 'Other'	Retrospective file study comparing males and females	Forensic patients adjudicated Not Guilty by Reason of Mental Disease or Defect, State forensic hospital	HCR-20 V3	Research purposes, Trained psychology graduate research assistants	5/7
<b>Lieser et al. (2023), UK</b>	42 (100%), 36 (19-61), 57% Caucasian, 38% Black, 5% 'Other'	Retrospective consecutive cohort design comparing HCR-20 V3 with FAM	Forensic psychiatric inpatients, Secure inpatient units	HCR-20 V3, FAM	Routine clinical practice, Qualified forensic psychologist	5/7
<b>Mastromanno et al. (2018), Australia</b>	40, 8 (20%) <sup>1, 2, 3</sup>	Retrospective follow-up of patient changes in HCR-20 V3 scores and relation with psychopathy and recidivism	Forensic psychiatric inpatients, Secure forensic mental healthcare facility	HCR-20 V3	Research purposes, Trained raters	7/7
<b>Sorge et al. (2022), Italy</b>	1 (100%), 32, Italian	Single case study	Forensic psychiatric patient on probation, Therapeutic residential community	HCR-20 V3 (Italian edition), LSI	Research purposes, Patient's psychologist	N/A
<b>Wolf et al. (2023), Germany</b>	99 (100%), 39 (18-67) <sup>3</sup>	Retrospective follow-up study assessing predictive validity of HCR-20 V3	Forensic psychiatric inpatients, Forensic psychiatric hospital	HCR-20 V3 (German edition), FAM	Research purposes, Trained raters	7/7

*Note: HCR-20 = Historical-Clinical-Risk Management-20, FAM = Female Additional Manual, VRS = Violence Risk Scale, LSI-R = Level of Service Inventory-Revised, IORNS = Inventory of Offender Risk, Needs, and Strengths, PCL-R = Psychopathy Checklist-Revised, SAPROF = Structured Assessment of Protective Factors, START = Short-Term Assessment of Risk and Treatability, N/A = Not Applicable*

### **3.4 Sample Characteristics**

It was anticipated that additional relevant sociodemographic information about the sample would also be available, such as financial, marital, family, education, employment, parenting, and accommodation status (Hamilton et al., 2017), however these characteristics were collected/provided by only one study (Green et al., 2016). Further relevant characteristics that were unavailable from most of the published manuscripts included previous experiences of abuse or trauma, prior arrests or convictions, previous hospital admissions, and HCR-20 V3 individual item scores or data. Where data were combined with that of men in the sample, authors were contacted and separate demographic and HCR-20 V3 data for women were requested.

Percentages provided for the following sections reflect the proportion of women with each characteristic out of the total number of women in the samples that provided these data.

#### **3.4.1 Race and Ethnicity**

Out of the five studies that provided the race or ethnicity of the women in their samples (Campbell & Beech, 2018; Chen et al., 2023; de Vogel et al., 2019; Green et al., 2016; Lieser et al., 2023), there appeared to be more women of White (61%), Black (19%), and Asian (35%) ethnic groups. This, however, does not provide a complete account of the numbers of women of each ethnicity across the total 445 women, due to this data being unavailable from six studies. All but one of the studies (Chen et al. 2023 was conducted in China) that provided information on ethnicity or race were conducted in Europe or the USA.

#### **3.4.2 Diagnosis**

Five studies provided the mental health condition or diagnosis given to the women in their samples (Campbell & Beech, 2018; de Vogel et al., 2019; Green et al., 2016; Lieser et al., 2023; Wolf et al., 2023), indicating that schizophrenia spectrum disorders (72%), substance misuse disorders (39%), and personality disorders (37%) were most prevalent. However, the women recruited by Wolf et al. (2023) all had a schizophrenia spectrum disorder, which may have skewed this finding. The least prevalent disorders across three studies (Campbell & Beech, 2018; Green et al., 2016; Wolf et al., 2023) were mood disorders (5%) and eating disorders (4%). Comorbidity was only measured by one study (Lieser et al., 2023).

### **3.4.3 Section and Service**

Four studies reported the type of section that patients were detained under (Campbell & Beech, 2018; de Vogel et al., 2019; Lieser et al., 2023; Wolf et al., 2023), with forensic sections (90%) being most common compared to civil sections (36%), across these four studies. Only two studies (Campbell & Beech, 2018; Chester et al., 2019), both conducted in the UK, reported whether the women in their samples resided on medium secure (37%), low secure (53%), or locked units (9%), as this is the security level system used across UK inpatient psychiatric hospitals.

### **3.4.4 Index Offence**

From the five studies that collected and reported the women's index offences (de Vogel et al., 2019; Green et al., 2016; Lieser et al., 2023; Sorge et al., 2022; Wolf et al., 2023), violent offences (43%) and homicide (36%) were the most common, followed by arson (17%), property (11%) and sexual offences (2%) among the subsamples of women.

### 3.5 Predictive Validity and Outcomes

#### 3.5.1 Predictive Validity

Table 2 displays the reported AUC values of the Historical, Clinical, Risk Management, and Total HCR-20 V3 scales. Using the guidelines produced by Rice and Harris (2005) regarding classifications of effect sizes, the Total HCR-20 V3 AUC values from the included studies ranged from low (.635) to high (.840) effect size, indicating that a randomly selected female patient who has engaged in the outcome will score higher on the HCR-20 V3 than a randomly selected female patient who has not engaged in the outcome, in at least 63% of cases.

**Table 4**

*Predictive validity of the HCR-20 V3 for measured outcomes in women.*

Study	n	Outcome, n who engaged in outcome (%)	Duration of follow-up	H	C	R	Total, Effect size classification
<b>Chen et al. (2023)</b>	58	Violence, 15 (26%)	6 weeks	.790	.770	.700	.850, High
			7-24 weeks	.770	.750	.660	.830, High
			6 months	.790	.730	.670	.840, High
<b>de Vogel et al. (2019)</b>	78	All recidivism (includes violent), 14 (18%)	3 years	.672	.680	.667	.711, High
			12 years	.636	.673	.641	.667, Medium
			3 years	.604	.655	.544	.635, Low
			12 years	.649	.690	.618	.672, Medium
<b>Green et al. (2016)</b>	24	Institutional violence, 13 (54%)	14 months	.660	.678	.455	.654, Medium
<b>Lieser et al. (2023)</b>	42	Physical violence, 31 (74%)	6 months	.713	.739	.730	.702, Medium



Study	n	Outcome, n who engaged in outcome (%)	Duration of follow-up	H	C	R	Total, Effect size classification
Lieser et al. (2023)	42	Non-physical violence, 11 (26%)		.581	.597	.516	.710, High
		Any violence, 42 (100%)		.610	.661	.541	.714, High
Wolf et al. (2023)	99	Violent index offence, 80 (81%)	10 years	Subscale AUCs not provided			AUCs not provided
		Institutional violence, 22 (22%)					AUCs not provided
		Violent recidivism, 9 (10%)					.695, Medium

Note: n = number of women, H = Historical subscale, C = Clinical subscale, R = Risk Management subscale, AUC = Area Under the Curve

A particularly important observation is that most studies did not state whether they rated the R items in the context of the patient remaining within an institution or being discharged to the community. One rated the R items in the context of an institution (Campbell & Beech, 2018), two in the context of discharge to the community (Cheng et al., 2019; Crabtree, 2019), and one discharge to a facility of lower restriction (Green et al., 2016). Although some studies did rate and analyse relevance of items, studies mainly reported the presence of items. Summary risk ratings were not included by the majority of the studies and only three studies analysed and reported them (Campbell & Beech, 2018; Chen et al., 2023; de Vogel et al., 2019).

### 3.5.2 Violence

Violence was the most common outcome measured among the included studies. Four out of the five studies that investigated violence as an outcome used the definition provided in the HCR-20 V3 manual (Douglas et al., 2013) to assess and

define violence (de Vogel et al. 2019 used a definition of violent recidivism). However, the type of violence and when it was measured differed between institutional violence and violent recidivism on discharge. Nevertheless, Table 2 shows that the HCR-20 V3 Total scale scores were generally moderately accurate in discriminating between the women who engaged in violence from the women who did not within these studies. de Vogel et al. (2019) found that predictive validity for all types of recidivism was moderate, but low for violence. However, the HCR-20 V3 Total scale effect size for violent recidivism increased to a medium effect size in the 12-year follow-up period compared to the 3-year follow-up period, indicating that accuracy only increased over long periods of follow-up, which may not be useful to clinicians who may want to assess risk of more immediate violence. Lieser et al. (2023) found larger effect sizes for the HCR-20 V3 subscales than the other studies and these were largest and significantly associated when predicting physical violence. In comparison, effect sizes for non-physical violence, defined as verbal abuse and threats, were smaller and were not significantly associated. The Total scale predictive validity was largest for any violence (combined physical and non-physical violence). In three studies that provided subscale AUCs (de Vogel et al., 2019; Green et al., 2016; Lieser et al., 2023), the predictive validity of the Total scale was outperformed by the Clinical scale, which yielded the highest AUC values in comparison to the other scales. This was in contrast to the findings by Chen et al. (2023) who reported larger effect sizes in the Total and Historical scales. The Risk Management scale, across all four studies, however, demonstrated lower predictive validity compared to the other scales.

Two studies analysed predictive validity of individual items of the HCR-20 V3 in women. Measuring the outcome of institutional violence, Green et al. (2016)

reported that the Historical item *history of problems with other antisocial behaviour* and the Clinical item *recent problems with instability* were significantly associated with violence in women. Similarly studying the outcome of institutional violence, Wolf et al. (2023) found that the Clinical items *recent problems with violent ideation or intent*, *recent problems with instability*, and *recent problems with treatment or supervision response* were significantly associated with institutional violence. Violent recidivism was significantly associated with the Historical item *history of problems with other antisocial behaviour – during childhood*, the Clinical items *recent problems with insight – treatment need* and *recent problems with instability – cognitive*, and the Risk Management item *future problems with treatment or supervision response*.

Three studies compared the HCR-20 V3 used alone, with the HCR-20 V3 used with the FAM in predicting violence in women-only samples (de Vogel et al., 2019; Lieser et al., 2023; Wolf et al., 2023). The HCR-20 V3 was found to have larger predictive validity alone than when used with the FAM in all three of the studies, indicating that the FAM was not as able to discriminate between violent and non-violent women. When predicting physical violence without the FAM, Lieser et al. (2023) reported larger effect sizes for each subscale and the Total scale of the HCR-20 V3, whereas the FAM was found to reduce predictive validity when used alongside each subscale and Total scale of the HCR-20 V3. Predictive validity did not differ between the HCR-20 V3 and the FAM when predicting any and non-physical violence. Two studies measured the LSI with the HCR-20 V3, however, either scores for women were not provided separately (Crabtree, 2019), or were provided without comparative analysis to the HCR-20 V3 (Sorge et al., 2022). Interestingly, the Short-Term Assessment of Risk and Treatability (START)

Vulnerability scale, measured only by de Vogel et al. (2019), predicted violent recidivism with larger effect size in both the three-year follow-up period (.697), and in the 12-year follow-up period (.704), when compared to the HCR-20 V3. The HCR-20 V3 remained performing better than the HCR-20 V2 at both the three-year follow-up period (.563) and the 12-year period (.592), in this sample of women, however (de Vogel et al., 2019).

Four studies compared differences in the HCR-20 V3 as a function of gender. Green et al. (2016) found that a higher proportion of women in the sample engaged in any and physical violence compared with men in the sample, however, this was not significantly different. The authors also reported a stronger relationship between scale scores and violence among men than women, although the difference was only significant for the Historical item *violent attitudes*, which was only significantly related to violence in men. Women in the sample were less likely to have been previously arrested and more likely to have been married previously compared with the men, although they scored significantly higher than men on the items *history of problems with relationships* and *history of problems with traumatic experiences*. Women were more likely to have been diagnosed with a mood disorder, although the most common diagnosis among the women was borderline personality disorder. Although no differences were observed between genders in associations between HCR-20 V3 scores and violence, authors reported that interrater agreement tended to be higher when rating men compared to women. Chen et al. (2023) reported that the effect sizes in women were significantly smaller on the Risk Management scale (relevance scores) compared to effect sizes in men. However, on the Clinical (presence and relevance scores) and Total scales (presence scores), effect sizes were significantly larger in women than men. The authors also found that the rate of

violence was higher in women than men, however, as the follow-up period increased, this reversed, and men were found to engage in more violence than women. Effect sizes remained higher for women across all time periods when presence ratings were used and were similar between men and women when relevance ratings were used. Crabtree et al. (2019) found that none of the women in the sample, compared with 17% of the men were classified as high risk on the HCR-20 V3. They found that three women were classified as low risk and the other three as moderate risk. Mastromanno et al. (2018) found that women's mean scores were lower than men's on the Clinical and Risk Management scales of the HCR-20 V3, both at the beginning and end of treatment, although this difference was not statistically significant.

### **3.5.3 Other Outcomes**

Campbell and Beech (2018) was the only study exploring the predictive validity of the HCR-20 V3 for self-harm in women. The Historical and Clinical scales were significantly positively associated with the frequency of self-harm, although the Risk Management scale was not. The HCR-20 V3 Total score was significantly positively associated with self-harm, with or without the FAM, however, the association was slightly stronger (non-significant) with the FAM items included.

Although mortality was not planned as an outcome measure at the outset, it was analysed post-hoc by de Vogel et al. (2019) following a high rate of death among the women in the sample during the follow-up period ( $n = 14, 18\%$ ). Mean age of death among the women who died was 45. The HCR-20 V3 was a weak predictor of mortality ( $AUC = .607$ ), with the Historical scale resulting in the largest

effect size (.605) compared to the Clinical (.585) and Risk Management (.600) scales. The FAM alone and with the HCR-20 V3 yielded low effect sizes (.550 and .608, respectively). Notably, the Psychopathy Checklist-Revised (PCL-R) Interpersonal facet was a significant protective factor for mortality (.308).

Three studies explored non-violent recidivism as an outcome. Unfortunately, separate data for women were not provided by Crabtree (2019) or Mastromanno et al. (2018) and the conclusions drawn from the analyses are likely to have better represented the subsamples of men as the subsamples of women in both studies were much smaller (33% and 20%, respectively). de Vogel et al. (2019) evaluated the predictive validity of the HCR-20 V3 compared with the other tools such as the FAM in an all-women sample. In the 3-year follow-up period, authors reported a higher AUC effect size for all recidivism (violent and non-violent) when the HCR-20 V3 was used alone (.711) compared to when the FAM was used alone (.676) or the two tools were used together (.695), although all three were significantly predictive of all recidivism. Interestingly, when the FAM final risk judgements for non-violent criminal behaviour were used alone to predict non-violent recidivism, effect sizes increased to .860 over the 3-year period.

#### **4. Discussion**

Women comprise an increasing subgroup of clinical and forensic service users but there is limited research on the use of SPJ risk assessment tools, such as the HCR-20 V3, with women as these tools have mainly been evaluated with men. This systematic review and narrative synthesis aimed to investigate the characteristics of the women assessed with the HCR-20 V3 and the contexts in which these studies occurred. Eleven papers included women in their samples who had been assessed with the HCR-20 V3, enabling preliminary exploration of their profiles and the

clinical and forensic settings they occupy. However, many of these studies used a relatively small sample of women, limiting external validity and generalisability (Steyerberg et al., 2003). In addition, there was great variability among the studies in the characteristics each provided, the outcomes measured, and the durations of follow-up, rendering comparison and summary of studies difficult. Areas of similarity across the studies included use of inpatient forensic psychiatric samples, retrospective cohort designs, and the violence definition among the studies exploring outcomes.

#### **4.1 Study and Sample Characteristics**

Studies were mainly conducted in Europe and North America, which is consistent with findings of other reviews that studied risk assessment of women (Geraghty & Woodhams, 2015; Rossdale et al., 2020). The finding that most women were of White, Black, or Asian ethnicity, the latter of which mainly comprised Chen et al.'s (2023) sample, may reflect the geographical locations of these studies. However, six studies did not provide race or ethnicity information, amounting to a third of the sample of women. This highlights the ongoing need for further research and improvement in reporting of characteristics such as this, to explore whether findings can be generalised across different countries and ethnicities. In addition, there is a need to ensure that risk assessments, found to be moderately racially biased in men (Monjazebe & Douglas, 2022), do not disadvantage women of ethnic minority groups by biasing them toward higher risk classifications.

Papers largely represented an inpatient forensic psychiatric population, with only two studies being conducted in a community setting and no studies in a prison setting, potentially reflecting the higher numbers of women in psychiatric versus prison settings and the need for violence risk assessment in inpatient contexts

compared with community services. This is consistent with Rossdale et al.'s (2020) review, which included fewer studies in civil psychiatric and prison settings, but contrasts with Geraghty and Woodhams (2015) and Gower et al. (2020) who observed that the majority of the samples in their reviews were correctional. This may reflect differing inclusion criteria.

Within the studies that provided this information, the majority of women were detained under forensic sections and resided on low secure units, suggesting a history of previous offending and violence, with a level of risk potentially assessed as low enough to not necessitate conditions of medium security. This is supported by a violent index offence being committed by around half of the women in the studies that reported this. During the follow-up period, the reported number of women who engaged in physical violence was 94 (31%), indicating that a minority of women in the samples continued to engage in violence. Similar findings were observed in previous reviews, which also noted that less than half of the females across their samples engaged in violence over the follow-up period (Gower et al., 2020; Geraghty & Woodhams, 2015).

The mean ages of the women in this review ranged from 32 to 48 across the studies that provided this, which was somewhat consistent with other reviews (Geraghty & Woodhams, 2015; Rossdale et al., 2020), though both the lower and upper mean ages in the previous reviews were younger than in the current review. It was not possible to compare age of the samples of women with the samples of men in the current review as five studies did not include men and four studies did not provide separate mean ages for the men. However, previous research comparing men and women have found that women at admission or court verdict are generally older than men in some samples, though not significantly so (de Vogel et al., 2022; Dean et



al., 2020). The older age detected in this review may be due to women being in institutions for some time before they were assessed with the HCR-20 V3, especially as this version was not released until 2013 and most studies used a retrospective design.

A retrospective design examining file information was primarily utilised among the studies, with only two papers using a prospective cohort design. A retrospective design enables data collection, analysis, and evaluation in a shorter timeframe without waiting for the follow-up period to elapse, thus reducing project duration and costs (Talari & Goyal, 2020). However, it increases the risk of missing data, poorer quality data, and participant attrition (Talari & Goyal, 2020). Additionally, retrospective coding of items using file information conflicts with the intended use of SPJ tools such as the HCR-20 V3, which advocate incorporating professional judgement by the clinical team based on individualised and collaborative formulation and knowledge of the person beyond written reports (de Vogel et al., 2022). Therefore, risk derived from totalling scores rated by researchers who likely never interacted with the individual aligns more with actuarial risk assessment methods that lack individualisation and targets for risk management (Douglas, 2014).

This is of particular importance for women, who are found to have more complex pathways to recidivism, such as victimisation, social marginalisation, poorer relational functioning, and mental health problems (Brennan et al., 2012). For example, women are diagnosed with borderline personality disorder at a higher rate than men in the clinical population (Huang et al., 2009; Chapman et al., 2022), and were diagnosed with borderline personality disorder in over a third of the cases across five studies in this review. Risk assessment of women in general, especially

those with borderline personality disorder, requires attention to subtler relational and interpersonal patterns that may have direct bearing on risk and management practices (Bohus et al., 2021; Whiting et al., 2020), which can be easily overlooked in written reports. Relying on file information without patient interview and team formulation, contrary to the HCR-20 V3 process (Douglas et al., 2013), may compromise risk assessment accuracy and subsequent management strategies (Hopton et al., 2018) and is not generalisable to contexts where the HCR-20 V3 may be used as recommended in routine clinical practice.

The remaining women across the five studies had a diagnosis of mainly schizophrenia spectrum disorders and substance misuse. It is unclear whether this was also the case in previous reviews as clinical or psychiatric populations of women were not the focus of these and frequencies of each diagnosis were not provided. However, in a national survey of mental health in England, 14% of people screened positive for any personality disorder, whereas less than 1% of people had a psychosis-related disorder (NHS, 2018). Wolf et al. (2023), whose paper was included in the current review, investigated a forensic psychiatric sample of women with a primary schizophrenia spectrum diagnosis, which could have inflated the total. The authors reported that around half of the sample also had a diagnosis of personality disorder or substance misuse. Any comorbidity was unspecified by three of the five other studies in this review, however, dual diagnosis is a common finding across psychiatric inpatient samples and there is often an overlap of schizophrenia with substance misuse and personality disorder (Howner et al., 2018).

#### **4.2 Using the HCR-20 V3 with Women**

Due to high variability in the designs and methods of the included studies, and a general tendency in research to analyse data from men and women together to

maximise statistical power, the use of the HCR-20 V3 with women was difficult to synthesise as limited information and conclusions could be extracted about women specifically that were similar across multiple studies.

Although many of the follow-up studies measured violent outcomes, variability in measures and procedures may have resulted in predictive validity of the HCR-20 V3 for violence in women also differing vastly between the studies. Effect sizes ranged from low to high for the total scale of the HCR-20 V3. The studies that found high effect sizes at six-month follow-up hold promise for accurate risk assessment of women in clinical and forensic services, however, only two studies found this, and both used a relatively small sample of women. Studies that found lower effect on violence followed women for longer durations, which may explain the reduced accuracy as the HCR-20 is intended to assess risk of future violence over a six-month period (Douglas et al., 2013). Studies that have evaluated the HCR-20 V3 with men have produced more consistent findings of larger effect sizes for the prediction of violence (K. J. Smith et al., 2020), indicating that the reliability of findings remain reduced for women and require further replication and with larger samples to improve this.

When attending to individual scales, the Clinical scale was generally the most accurate predictor of violence in women, while the Risk Management scale was the least. This contrasts with studies of predominantly male samples that report predictive validity and larger effect sizes across all subscales (Doyle et al., 2014). However, many of the included studies rated Risk Management items, intended as predictors of future risk, in retrospect, which may have been difficult to assess using historic file information, thus reducing the predictive validity of this scale. In addition, many of the studies did not specify whether the items were rated in the

context of individuals remaining in the institution or being discharged to the community in the next six months. This may have affected the performance of the scale if assessment and consideration of factors did not correspond with the future treatment or discharge plans for the individual. It therefore remains unclear without further research that addresses these limitations in ascertaining whether the Risk Management scale adds predictive value to the risk assessment of violence in women. However, it is likely that current and modifiable risk factors, such as those assessed by the Clinical scale, are particularly useful and relevant to assess in women.

Only two studies explored individual items, reporting that previous antisocial behaviours and recent instability were most associated with violence. Both factors are consistent with previous research on lifestyle and personality features that may make violence more likely in women's lives. Poor emotional and behavioural control and diverse criminal offending may put women in risky situations that result in both violent victimisation and perpetration (Turanovic et al., 2015). This is worth bearing in mind as interventions provided within an institution may help to improve instability while the individual is residing there, whereas lifestyle factors and criminogenic social environments are much more difficult to improve from within an institution. These vulnerability factors for future violence may require community service in-reach and holistic social care packages that include financial, housing, and mental health support to maintain desistance (Gålnander, 2020). This is especially true for older women and those of ethnic minority or non-white groups, of which the included samples comprised, who may have lived with social exclusion and disadvantage for longer periods than their counterparts, especially in Western countries. Being a woman with these sociodemographic characteristics produces

cumulative disadvantage (Mann, 1989). This may result in a weakened social position in society, which increases barriers to desistance and social inclusion (Bersani and Doherty, 2018). Barriers include limited work and educational opportunities, poorer health outcomes, smaller social network, and poverty (Hinze et al., 2012), that wider policy and social support measures could help with.

The risk assessment tool that comes closest to capturing risk factors specific to women is the FAM, albeit without direct consideration of these particularly disadvantaged subgroups, although some of the items may reflect the effects of lived disadvantage, e.g. low self-esteem, suicidality/self-harm. The tool makes efforts to consider issues found to be particularly relevant to the risk behaviour of women in general within clinical and forensic settings. However, this review found that the FAM, when used by itself, did not perform as well in predicting violence as the HCR-20 V3 alone. In fact, when used in conjunction with the HCR-20 V3, the FAM reduced the significance and effect size, especially for outcomes of physical violence. This led to many studies concluding that, although the FAM may have been a valuable addition to the HCR-20 V2, the amendments to the HCR-20 V3 may have slightly improved the accuracy of risk assessment with women (de Vogel et al., 2019), although the mechanisms of this improvement remain unclear without further exploration of the assessment process with the HCR-20 V3 and the specific aspects that add value and accuracy to the prediction of violence risk in women.

#### **4.3 Limitations of the Literature**

The exploration of existing literature revealed several limitations that impact the generalisability and robustness of findings regarding the use of the HCR-20 V3 with women. Despite the increasing numbers of women in clinical and forensic settings, there remains a scarceness of research focused on the use of risk assessment

tools with women specifically. Many studies included in this review featured relatively small samples of women using heterogeneous methods, which limit the external validity and generalisability of results, and reduce the clarity of any conclusions. The majority of studies were conducted in Europe and North America, reflecting a narrow geographical focus that may also limit the generalisability of findings to other regions, nationalities, and cultures. Additionally, a substantial proportion of studies did not provide information on ethnicity, impacting the ability to consider the use of the HCR-20 V3 with a diverse female population.

Quality appraisal of the studies revealed that many did not measure or control for psychosocial or demographic factors such as age, ethnicity, diagnosis, co-morbidity, financial status, marital status, education, employment, housing status, presence of substance addiction, or presence of trauma, previously found to be relevant or potentially confounding (Hamilton et al., 2017). This would have enabled evaluation of whether and how predictive validity differed as a function of these factors and better ascertained the capacity of the HCR-20 V3 in assessing risk in all women or select subgroups. This is especially important as some groups of women were underrepresented in the included samples, such as women of ethnic minority backgrounds, women in prison, community mental health or community forensic settings, and women who had a diagnosis other than schizophrenia spectrum, substance misuse, or personality disorders.

In addition to issues of representativeness and generalisability, the way in which the HCR-20 V3 risk assessments were conducted in some studies highlighted the potential absence of implementation of the tool's newest version updates. An important addition to the HCR-20 V3 was the relevance ratings for each item that allow for assessment of not only presence, but also of whether a risk factor directly

contributed to past violence, has any bearing on decision-making that promotes violence, and is critical to risk management plans (Douglas, 2014). Although some studies utilised relevance ratings, most only reported and analysed the presence of items. This indicates that the full intended features of the HCR-20 V3 are not being applied by researchers or clinicians, limiting the reliability of the findings. Moreover, Chen et al. (2023) found that effect sizes differed less between men and women when relevance ratings were used, suggesting that using relevance ratings could improve the accuracy of risk assessment for women, making it potentially comparable to the assessment accuracy observed for men.

An additional shortcoming of some studies was their neglect to assess or report summary risk ratings, which allow the rater to make an overall judgement of the level of risk of the individual after careful consideration of all factors (Douglas et al., 2013). Prior research has shown that the summary risk ratings used by SPJ instruments are as, or more, accurate than the use of actuarial instruments and have been found to improve predictive validity in male samples (Douglas, 2014). Thus, by overlooking them in assessment and analysis, predictive validity of the HCR-20 V3 in women may have been underestimated.

A further issue with the use of the HCR-20 V3 in the included studies is the impact of not specifying whether the Risk Management scale was scored in the context of discharge to the community in the next six months or remaining within an institution. As has been discussed, this may have affected the low effect sizes found for this scale, which may have resulted from being unable to accurately assess whether the five risk factors in the scale will be present or relevant to the individual in the upcoming months. For example, the score for the items *future problems with living situation* and *future problems with personal support* may very well increase if

rated prior to community discharge where an individual has previously found it difficult to remain in stable and suitable accommodation or plans to move to an area that is a considerable distance from protective family members or friends. These items would have been especially difficult to rate accurately in retrospect using file information, which was the design of many of the included studies.

## **5. Conclusions**

This review aimed to shed light on the characteristics of women and the existing literature that has investigated the application of the HCR-20 V3 in assessing women's risk. There was a small number of eligible studies and they utilised relatively small samples of women. Within this limited scope, however, this review found that most research on the HCR-20 V3 used with women took place in inpatient forensic psychiatric settings where the majority of women were detained under forensic sections and resided on low secure units. The mean ages of the women ranged from 32 to 48 and most women had a schizophrenia spectrum disorder, substance misuse diagnosis, or a personality disorder.

Where studies evaluated predictive validity, effect sizes for violence in women were lower than effect sizes reported in previous research with men. This emphasises the importance of individual formulation rather than relying on the number of factors present or absent for women, utilising relevance ratings to make judgements about level of risk and creating risk management and care plans informed by formulation and treatment needs identified from assessment. Analysis of individual items indicate that emotional, behavioural or cognitive instability are particularly relevant in women's future risk of violence and may highlight areas for interventions to target, e.g. emotional and behavioural regulation strategies. However, these may only go so far as to address



institutional risk as violence in the community is likely to be precipitated by lifestyle and psychosocial factors.

Some methodological limitations of the included studies may explain some of these findings, which may not have captured the full spectrum of characteristics of women, the settings they occupy, and the full utility of risk assessment with the HCR-20 V3. Nonetheless, this review supports that gender differences may exist with regards to violence and offending and further research on women's risk and assessment is warranted.

### **5.1 Recommendations for Research and Practice**

Limitations identified in the existing literature highlight the need for further research that addresses these shortcomings. Future studies should aim to study larger and more diverse female samples, keep any women in the sample without excluding them, and report and describe their characteristics, even if analysis is not possible. Where separate analysis of women's data is possible, merely including gender as a control variable in statistical models is inadequate and could lead to potentially important differences between men and women being missed (Turanovic et al., 2015). Future studies should also fully incorporate the updates of the HCR-20 V3 by using and evaluating relevance ratings, summary risk ratings, risk formulations, and scenarios that have not yet been sufficiently investigated. Ideally, studies would be conducted prospectively, utilising HCR-20 V3 assessments that have been completed in routine practice as opposed to retrospectively using file information without interview of the individual. Studies should consider and specify in their manuscripts the context in which Risk Management items were assessed. Studies need to record and

report comprehensive sociodemographic information and identify subgroups of women to explore the effects of intersecting characteristics on predictive validity.

Clinically, professionals should rate items based on both presence and relevance, the latter of which may assist in making judgements of overall risk. Individuals should be interviewed to inform their risk assessment and allow the opportunity for collaborative formulation and treatment planning. Individualised formulations should be developed and used to generate solutions and plans to manage and prevent risk. The findings from this review do not support the use of the FAM, however, professionals may wish to assess and be aware of these additional factors that may impact risk and be of relevance to individual formulations.

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## **Chapter Five: Discussion and Critical Evaluation**

This thesis systematically reviewed, synthesised, and presented the data and findings on violence in individuals released from prison and women assessed with the HCR-20 Version 3. By methodically extracting information from each study, it was also possible to evaluate the quality of the available research and identify design and reporting flaws that could both explain findings and elucidate how future practice and research could be improved.

### **Summary of Findings**

The first review and meta-analysis showed that static factors such as male sex, young age, criminal history, previous violence, prior unauthorised leave, and previous condition breach predicted violent recidivism following release from prison. The dynamic factors strongly related to violent reoffending included having a personality disorder, education and employment problems, having associates involved with crime, and relationship problems. This highlighted the factors that could enable early identification of individuals requiring most urgent intervention and the factors that could be improved with targeted interventions to reduce risk. As discussed, interventions could be implemented both prior to and after release from prison and by multiple disciplines and agencies. However, limitations of the review indicated that further research is required to support the findings and test the effectiveness of such interventions in reducing future violent reoffending.

The second review and narrative synthesis showed that women may have differing risk factors to men that are not fully captured by the HCR-20 Version 3 items. The Clinical scale was most predictive of future violence in women, indicating the importance of dynamic and current or recent mental state related factors. This is different to male samples where all scales have previously been

found to accurately predict violence. Studies mainly represented women over the age of 30 in low secure inpatient mental health units detained under forensic sections. Clinical presentations most commonly comprised personality disorder, schizophrenia spectrum disorder, or substance misuse. As the studies had differing designs and methods and had implemented the HCR-20 Version 3 in unverified ways, it was unclear whether use of the instrument was entirely appropriate for assessing risk of violence in women, especially in those with clinical and demographic profiles that fell outside of those studied.

### **Limitations**

Several limitations were apparent within the overall thesis and the individual reviews. Each review included a small number of studies (no more than 16 studies), which may have affected the power of the pooled data and the ability to synthesise the research reliably, especially as considerable heterogeneity was found between the studies.

Heterogeneity would usually be explored by subgroup analysis, which was not possible in the meta-analysis due to small numbers of studies in each risk factor domain, which would have rendered the analysis inconclusive (Sterne et al., 2011). Had this have been possible, post-hoc subgroup analysis comparing groups of study characteristics would have been conducted to check whether effect sizes differed as a function of these. Effect sizes would have been compared for small/large sample sizes, male-only samples/mixed samples/female-only samples, less than two years/more than two years follow-up durations, and high/low rates of violent recidivism. This would have potentially enabled the source of the heterogeneity to be identified and would have informed any nuance in the risk factors identified, for



example whether they were only related to violent recidivism in specific circumstances, such as in larger samples or male-only samples, for instance.

Similarly, tests of publication bias such as the Egger's test were also not possible due to each risk factor domain in the meta-analysis being comprised of at most six studies, which would have been insufficient to detect any true bias (Sterne et al., 2000). Funnel plots may have been an alternative to the Egger's test, however, a review of funnel plot use in meta-analyses found that asymmetry in the plot, which is indicative of bias, tended to be greater in meta-analyses that included smaller number of studies (Song et al., 2002). Had it been possible to include the recommended number of studies of at least 10 per meta-analysis, this may still have been underpowered in detecting publication bias (Alfonso et al., 2023).

An important limitation of the meta-analysis was that it relied on the risk factors that were measured and made available for extraction and conversion by the studies. There was a wide range of many different risk factors measured by the included studies. However, many could not be included in analysis as they were measured by a single study. It is useful for studies to be measuring a comprehensive range of risk factors in released prisoner samples, however, pooling of these for meta-analysis is limited to those risk factors that at least one other study has also measured. If there are additional risk factors that predict violent recidivism, it is not possible to observe without multiple studies measuring, analysing, and reporting their effect on violent recidivism. This is likely to have influenced the results and likely manifested in the factors that were hypothesised to be related to violent recidivism, such as mental health, substance misuse, and pro-criminal attitudes, which were not found to be so.

Consequently, analysis included small numbers of studies within each risk factor domain, which impacted the power and validity of each risk factor and affected the ability to be selective of studies with the highest quality rating. All eligible studies were therefore included in the review and the analysis, where there were sufficient numbers of risk factors to pool. The R statistical computing software contains a function to conduct leave-one-out analyses where any changes in effect sizes can be appraised in response to each study being removed one by one (Wang, 2023). This could have been utilised to check the individual influence of studies on effect size and whether there were any outliers, specifically lower rated studies, that if removed from analysis, could have reduced heterogeneity, increased effect size, or highlighted the studies that required further exploration to explain their unique findings. However, even when domains comprised of the minimum number of risk factors that could be pooled (two), high heterogeneity and wide prediction intervals remained, indicating that this method may also have proven futile due to the methodological diversity of each study.

The narrative synthesis also suffered from varying methods of the included studies, which impacted the amount of information that could be extracted from multiple sources for reliability of conclusions. Conclusions that were drawn were required to be tentative as only a small number of studies, all with small numbers of women in their samples, reported such findings. In this review, the quality of the studies was appraised, however, due to high heterogeneity, the selected quality assessment tool (JBI) was unable to appropriately capture the quality of some studies. Hence, one study that reported a single case was unable to be rated. However, other tools that were considered, including the Critical Appraisal Skills Programme (CASP; 2023), Strengthening The Reporting of Observational Studies in

Epidemiology (STROBE; 2024), and the Newcastle-Ottawa Quality Assessment Scale for cohort studies (NOQAS; Wells et al., 2014). These had very similar items to the JBI and so the JBI was selected due to its brevity, clarity, and ability to derive a total rating for each study.

### **Strengths**

A major strength of this thesis is that at least five databases, plus reference lists of other relevant reviews, were searched for each review without filtering these by language. Although publication bias could not be assessed using tests or funnel plots, searching four or more databases has been found to minimise the risk that papers or studies that are smaller or less well-cited are missed, thus automatically reducing likelihood of publication bias (Song et al., 2002). This is also supported by the database search results capturing grey literature (unpublished theses/dissertations), which were subsequently included in the reviews.

Odds ratios were selected as the effect size to pool in the meta-analysis as they are widely used by other reviews and researchers and easy to interpret. Although odds ratios and confidence intervals were calculated prior to analyses in the first review and this may have introduced some error or inaccuracy, every effort was made to ensure that accuracy was maintained by cross-checking values. Additionally, where these were not reported directly by the included studies and analyses suggested that they may be available in statistical outputs, authors of papers were contacted and asked to provide the odds ratios or other effect sizes that could be converted (e.g. correlation coefficients, Fisher's z, beta coefficients) to enable values to be extracted more directly rather than relying on calculations. Formulas and online calculators verified by supervisors and The University statisticians were then used to convert coefficients to odds ratios.

While constructing the risk domains before meta-analysing, care was taken to ensure that risk factors were only grouped into a risk domain if they were defined similarly and measured in the same direction using the same type of variable (continuous/dichotomous). Few studies measured categorical variables, which subsequently required excluding as different categories were used that did not correspond across different papers. As there were clear heterogeneous methods found among the studies, including the outcomes measured, definitions of risk factors measured, and the follow-up durations, a random-effects model was selected as opposed to a fixed-effects model, to best mitigate the impact of these variations. This was to ensure greater validity of the pooled odds ratios, although may have reduced the power of the effects observed (Cafri et al., 2010).

For the narrative review, authors of the included studies were also contacted to request separate data for women as many studies that included women in their samples were found to report this data in combination with the men in the sample. Any data provided by author responses was included in the review, although the limited available information reflects the lack of response from some authors and the general trend for research to combine male and female samples, which was highlighted and discussed in the narrative review as an observation that could be improved in future research.

In addition, the narrative review was completed using a standardised form for extracting information and data from each included study. The research was methodically reviewed and descriptions of the design and procedure, any limitations, and conclusions were recorded for each paper prior to being reviewed and synthesised to summarise and explain any common findings. This was done due to the absence of research and reporting guidelines for narrative synthesis reviews,

although there is a project in progress that is attempting to create such guidelines (Campbell et al., 2018).

### **Implications and Conclusions**

As the meta-analysis review predominantly represented male samples, and the narrative review represented female samples, findings could indicate some important similarities and differences between men and women and their offending behaviour and pathways into and out of criminal justice systems.

Emotional, behavioural, or cognitive instability was found to be relevant for the prediction of future violence in inpatient women. Although instability was not measured as a risk factor by the studies included in the meta-analysis, the dynamic factors observed to be related to violent recidivism in men could be related to each other and potentially be understood in the context of instability. For example, it would be difficult for men and boys to perform well academically, find and keep steady employment, and initiate and maintain healthy relationships and prosocial friendships if they had problems with emotional/behavioural instability. Moreover, personality disorder, of which instability is a feature (Ullrich & Coid, 2010), was found to be a risk factor for violent reoffending in men released from prison and was a common clinical presentation of the women in the included samples.

Green et al. (2016) found that the men were more likely to receive a diagnosis of antisocial personality disorder, while women more often received a diagnosis of borderline personality disorder. Despite these differing overt clinical presentations of men and women, research proposes there to be common underlying pathways of development shared between the two diagnoses, including reduced emotion regulation skills arising from both inherited impulsivity and invalidating

childhood environments and relationships (Beauchaine et al., 2009), indicating complex interplay of internal and external contributing factors. These presentations in adulthood highlight areas for clinical intervention such as the aforementioned Dialectical Behavior Therapy (Mills et al., 2019) and Mentalisation Based Therapy (Falcao et al., 2022) that have emerging evidence for effectiveness in treating borderline and antisocial personality disorder.

Although much of the research on violence, such as the reviews in this thesis, focuses on individual-level risk factors for violence and diagnoses such as personality disorder, these place imbalanced responsibility onto the individual without sufficient attention to environmental and social factors such as those found in the development of these problems. Therefore, researchers have a duty to design studies that focus on a broad range of individual, family, community, and societal level factors and discuss those that are missing from the focus of their study. Without doing so, researchers risk worsening the existing stigma that individuals with diagnostic or risk factor labels already face (Sheehan et al., 2016).

Differences between men and women who have had contact with the criminal justice system were also supported by the findings of these reviews. Historical factors that include previous offending or violence and resistance to mandated restrictions (unauthorised leave and condition breaches) were found to be more relevant in men who reoffend violently, while these historical factors were not the most predictive of future violence in women. Women who were violent on follow-up were found to score higher on current or recent problems with mental state, such as insight, violent ideation, instability, and mental health symptoms, captured by the Clinical scale of the HCR-20 Version 3. This indicates that treatments may require their focus to be adapted and tailored based on the gender and the specific risk

profiles of the recipients. In addition, future research should investigate these avenues to check whether replication of results can be achieved in matched samples of men and women.

Overall, results of these reviews indicate that violence as a future outcome may have specific associated risk factors that may differ between men and women. However, limitations within the reviews restrict the ability to reliably ascertain exactly which risk factors are most important for violence in released prisoners and women and which risk factors are missing from this picture and also warrant consideration when designing or implementing interventions. What these reviews do show with more certainty however is the need for further empirical investigation into these under-researched populations and settings, utilising consistent methods, and measuring a broad range of risk factors that could enable further, more powerful, reviews.

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<https://doi.org/10.35566/jbds/v3n2/wang>

Wells, G., Shea, B., O'Connell, D., Peterson, J., Welch, V., Losos, M., & Tugwell, P. (2014). *Newcastle-Ottawa quality assessment scale cohort studies*. University of Ottawa. <https://www.ncbi.nlm.nih.gov/books/NBK99082/bin/appb-fm4.pdf>

Winchester, N. (2023). *Trends in violent crime*. Office for National Statistics.

<https://shorturl.at/huVZ5>

## Appendices

### Appendix A: Submission guidelines for *Trauma, Violence, & Abuse*

<https://journals.sagepub.com/author-instructions/TVA>

#### Manuscript Submission Guidelines:

TVA accepts comprehensive reviews of research or legal reviews that address any aspect of trauma, violence or abuse. Reviews must be based on a sufficient number of studies to justify synthesis. Reviewed literatures may come from the social or behavioral sciences or the law.

#### Each manuscript must:

- be prepared using APA style, and be no longer than 40 double-spaced pages, including references, tables, and figures;
- include an abstract of up to 250 words describing the topic of review, method of review, number of research studies meeting the criteria for review, criteria for inclusion, how research studies were identified, and major findings;
- begin with a clear description of the knowledge area that is being researched or reviewed and its relevance to understanding or dealing with trauma, violence, or abuse;
- provide a clear discussion of the limits of the knowledge that has been reviewed;
- include two summary tables: one of critical findings and the other listing implications of the review for practice, policy, and research;
- include a discussion of diversity as it applies to the reviewed research.\*

All manuscripts are peer reviewed and should be submitted with a letter indicating that the material has not been published elsewhere and is not under review at another publication. Manuscripts should be submitted electronically to <http://mc.manuscriptcentral.com/tva> where authors will be required to set up an online account on the SAGE Track system powered by ScholarOne. Inquiries may be made by email at [jiv@u.washington.edu](mailto:jiv@u.washington.edu).

Authors who would like to refine the use of English in their manuscript might consider using the services of a professional English-language editing company. We highlight some of these companies at <http://www.sagepub.com/journalgateway/engLang.htm>.

Please be aware that SAGE has no affiliation with these companies and makes no endorsement of them. An author's use of these services in no way guarantees that his or her submission will ultimately be accepted. Any arrangement an author enters into will be exclusively between the author and the particular company, and any costs incurred are the sole responsibility of the author.

#### Please note:

Reviews of issues related to trauma, violence, and/or abuse are not appropriate for TVA unless they are based on a comprehensive review of research. TVA does not publish case studies or reports on individual research studies.

TVA does not respond to author inquiries regarding the interest of the journal in their manuscript or on the suitability of their manuscript for TVA. The mission and

parameters of TVA are clearly stated above and TVA assumes that authors are in the best position to know if their work is consistent with the aims and scope of the journal.

**\*Journal policy on addressing diversity in manuscripts:**

TVA requires all submissions to include a discussion of diversity as it applies to the reviewed research (e.g., nature of the sample, limitations of the measurement). The discussion should address the body of knowledge reviewed as it addresses or fails to address issues of diversity. Diversity concerns are not a criteria for publication but must be addressed. The nature of the discussion and amount of space devoted to the discussion is the responsibility of the author(s).

TVA understands diversity to include all aspects of human differences such as socioeconomic status, race, ethnicity, language, nationality, sex, gender identity, sexual orientation, religion, geography, ability, age, and culture.

Diversity as a core value embodies inclusiveness, mutual respect, and multiple perspectives and serves as a catalyst for expanding knowledge and practice with all human beings. While science seeks knowledge that can be generalized, it must appreciate that specific findings, while important in understanding the unique experiences of individuals or groups, are not necessarily applicable to all.

**Manuscript Preparation**

Manuscripts should be prepared using the APA Style Guide, and should be no longer than 40 double-spaced pages, including references, tables, and figures. Text must be in 12-point Times New Roman font. Block quotes may be single-spaced. Manuscripts must include margins of 1 inch on all sides and pages must be numbered sequentially. All files should be in Word (.docx or .doc).

The manuscript should include five major sections (in this order): Title Page, Abstract, Main Body (blinded, with all author names and identifying information removed for peer review), References, and Author Biographies.

Sections in a manuscript may include the following (in this order): (1) Title page, (2) Abstract, (3) Keywords, (4) Text, (5) Notes, (6) References, (7) Tables, (8) Figures, (9) Appendices, and (10) Author Biographies.

**1. Title page must be uploaded as a separate file. Please include the following:**

Full article title

Acknowledgments and credits

Each author's complete name and institutional affiliation(s)

Grant numbers and/or funding information

Conflict of interests, if any

Corresponding author (name, address, phone/fax, e-mail)

**2. Abstract.** Copy and paste the abstract (150 to 250 words) into the space provided, headed by the full article title. Omit author names. Abstract must describe the topic

of the review, method of review, number of research studies meeting the criteria for review, criteria for inclusion, how research studies were identified, and major findings.

**3. Keywords.** 5-7 keywords must be included in the manuscript.

**4. Text.** Begin text headed by the full article title. Text must be blinded, with all author names and other identifying information removed, for peer review.

a. **Headings and Subheadings.** Subheadings should indicate the organization of the content of the manuscript. Generally, three heading levels are sufficient to organize text.

Level 1: centered, boldface, upper & lowercase

Level 2: flush left, boldface, upper & lowercase

Level 3: indented, boldface, lowercase paragraph heading ending with a period

Level 4: indented, boldface, italicized, lowercase paragraph heading ending with a period

Level 5: indented, italicized, lowercase paragraph heading ending with a period

b. **Citations.** For each text citation there must be a corresponding citation in the reference list and for each reference list citation there must be a corresponding text citation. Each corresponding citation must have identical spelling and year. Each text citation must include at least two pieces of information: author(s) and year of publication. Following are some examples of text citations:

(i) **Unknown Author:** To cite works that do not have an author, cite the source by its title in the signal phrase or use the first word or two in the parentheses. For example, “The findings are based on the study of students learning to format research papers” (“Using XXX,” 2001)

(ii) **Authors with the Same Last Name:** Use first initials with the last names to prevent confusion. For example, “L. Hughes, 2001; P. Hughes, 1998.”

(iii) **Two or More Works by the Same Author in the Same Year:** For two sources by the same author in the same year, use lowercase letters (a, b, c) with the year to order the entries in the reference list. The lower-case letters should follow the year in the in-text citation. For example, “Research by Freud (1981a) illustrated that...”

(iv) **Personal Communication:** For letters, e-mails, interviews, and other person-to-person communication, citation should include the communicator's name, the fact that it was personal communication, and the date of the communication. For example, E. Clark, personal communication, January 4, 2009. Do not include personal communication in the reference list.

(v) **Unknown Author and Unknown Date:** For citations with no author or date, use the title in the signal phrase or the first word or two of the title in the parentheses and use the abbreviation "n.d." (for "no date"). For example, “The study conducted by the students and research division discovered that students succeeded with tutoring” (Tutoring and APA, n.d.).



**5. Notes.** If explanatory notes are required for your manuscript, insert a number formatted in superscript following almost any punctuation mark. Footnote numbers should not follow dashes ( — ), and if they appear in a sentence in parentheses, the footnote number should be inserted within the parentheses. The footnotes should be added at the bottom of the page after the references. The word “Footnotes” should be centered at the top of the page.

**6. References.** Basic rules for the reference list:

The reference list should be arranged in alphabetical order according to the authors’ last names.

If there is more than one work by the same author, order them according to their publication date – oldest to newest (therefore a 2008 publication would appear before a 2009 publication).

When listing multiple authors of a source use “&” instead of “and.”

Capitalize only the first word of the title and of the subtitle, if there is one, and any proper names – i.e., only those words that are normally capitalized.

Italicize the title of the book, the title of the journal/serial and the title of the web document.

Manuscripts submitted to TVA should strictly follow the current APA style guide.

Every citation in text must have the detailed reference in the Reference section.

Every reference listed in the Reference section must be cited in text.

Do not use “et al.” in the Reference list at the end; names of all authors of a publication should be listed there.

**7. Tables.** They should be structured properly. Each table must have a clear and concise title. When appropriate, use the title to explain an abbreviation parenthetically, for example, Comparison of Median Income of Adopted Children (AC) v. Foster Children (FC).

**8. Figures.** They should be numbered consecutively in the order in which they appear in the text and must include figure captions. Figures will appear in the published article in the order in which they are numbered initially. The figure resolution should be at least 300dpi at the time of submission.

**IMPORTANT: PERMISSION** - The author(s) are responsible for securing permission to reproduce all copyrighted figures or materials before they are published in TVA. A copy of the written permission must be included with the manuscript submission.

**9. Appendices.** They should be lettered to distinguish from numbered tables and figures. Include a descriptive title for each appendix (e.g., “Appendix A. Variable Names and Definitions”). Cross-check text for accuracy against appendices.

**10. Author Biographies.** Author(s) are required to send a 40-60 word biography for publication at the end of the article.

## Appendix B: Quality Appraisal Form (NOQAS)

Newcastle-Ottawa Quality Assessment Scale (NOQAS; Wells et al., 2014) adapted to exclude item 4.

**Group:**

**Paper:**

<b>Assessment of quality of a cohort study – Newcastle Ottawa Scale</b>		
<b>Selection</b> (tick one box in each section)		
1. Representativeness of the intervention cohort		
a) truly representative of the <u>average, elderly, community-dwelling resident</u>	★	<input type="checkbox"/>
b) somewhat representative of the <u>average, elderly, community-dwelling resident</u>	★	<input type="checkbox"/>
c) selected group of patients, <u>e.g. only certain socio-economic groups/areas</u>		<input type="checkbox"/>
d) no description of the derivation of the cohort		<input type="checkbox"/>
2. Selection of the non intervention cohort		
a) drawn from the same community as the intervention cohort	★	<input type="checkbox"/>
b) drawn from a different source		<input type="checkbox"/>
c) no description of the derivation of the non intervention cohort		<input type="checkbox"/>
3. Ascertainment of intervention		
a) secure record (eg health care record)	★	<input type="checkbox"/>
b) structured interview	★	<input type="checkbox"/>
c) written self report		<input type="checkbox"/>
d) other / no description		<input type="checkbox"/>
4. Demonstration that outcome of interest was not present at start of study		
a) yes	★	<input type="checkbox"/>
b) no		<input type="checkbox"/>
<b>Comparability</b> (tick one or both boxes, as appropriate)		
1. Comparability of cohorts on the basis of the design or analysis		
a) study controls for <u>age, sex, marital status</u>	★	<input type="checkbox"/>
b) study controls for any additional factors ( <u>e.g. socio-economic status, education</u> )	★	<input type="checkbox"/>
<b>Outcome</b> (tick one box in each section)		
1. Assessment of outcome		
a) independent blind assessment	★	<input type="checkbox"/>
b) record linkage	★	<input type="checkbox"/>
c) self report		<input type="checkbox"/>
d) other / no description		<input type="checkbox"/>
2. Was follow up long enough for outcomes to occur		
a) yes, if median duration of follow-up $\geq$ 6 month	★	<input type="checkbox"/>
b) no, if median duration of follow-up $<$ 6 months		<input type="checkbox"/>
3. Adequacy of follow up of cohorts		
a) complete follow up: all subjects accounted for	★	<input type="checkbox"/>
b) subjects lost to follow up unlikely to introduce bias: number lost $\leq$ 20%, or description of those lost suggesting no different from those followed	★	<input type="checkbox"/>
c) follow up rate $<$ 80% (select an adequate %) and no description of those lost		<input type="checkbox"/>
d) no statement		<input type="checkbox"/>

NB Underlined text 'customised' for the intervention being reviewed

## Appendix C: Descriptions of Risk Factor Domains

**Table 3**

*Risk factor domain descriptions.*

<b>Risk Factor Domain</b>	<b>Description</b>
Age At First Arrest	Age at first arrest or conviction
Age At Release	Age at release from prison or confinement
Associates	Gang membership, antisocial peers, criminal involvement of associates
Criminal History	Any previous arrests or convictions, parole revocations, incarcerations
Disciplinary Incidents	Incidents in prison resulting in disciplinary action or segregation
Drug Offences	Previous drug sale, drug trafficking, drug offences
Leisure	Lack of engagement in pro-social activities or with a pro-social group of people, use of spare time contributes to problems
Male Sex	Sex recorded at birth is male
Non-Violent Offences	Previous non-violent offences or arrests
Other Offences	Other offences relative to other classifications e.g. violence
Personality Disorder	Personality disorder characteristics or diagnosis
Previous Community Supervision	Previous community supervision or parole/probation supervision periods
Previous Condition Breach	Previous violation or breach of conditions or parole, failure during supervision
Previous Incarceration	Secure custody in youth, previous prison sentence
Previous Violence	Previous violent offence e.g. assault or robbery
Problems With Accommodation	Will not have upon release a fixed address, healthy or sanitary living environment, or will be living in a high crime neighbourhood
Problems With Alcohol	Alcohol use disorder diagnosis or alcohol use impacts on personal functioning
Problems With Drugs	Drug use disorder diagnosis or drug use impacts on personal functioning
Problems With Education/Employment	Frequent unemployment, previous dismissal, suspension or expulsion from school, did not complete schooling, poor peer or authority interactions
Problems With Finances	Difficulty paying bills, accumulated large debt, gambling problem, poor financial management
Problems With Relationships	Dissatisfaction with or unsupportive marital or family relationships
Problems With Substances	Drug or alcohol problem that has impacted life negatively or contributed to law violations, unable to abstain from substance use

Pro-Criminal Beliefs/Attitudes	Attitude is supportive of crime or non-favourable toward non-crime alternatives, greater acceptance of violence
Property Offences	Property offences relative to other classifications e.g. violence
Psychological/Mental Health Problems	Psychological issues that interfere with social functioning, past or current mental health treatment
Time Served	Months served in prison
Unauthorised Leave	Previous escapes or escape attempts

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## **Appendix D: Submission guidelines for *Aggression and Violent Behavior***

<https://www.sciencedirect.com/journal/aggression-and-violent-behavior/publish/guide-for-authors>

### **Preparation**

#### **Queries**

For questions about the editorial process (including the status of manuscripts under review) or for technical support on submissions, please visit our Support Center.

#### **NEW SUBMISSIONS**

Submission to this journal proceeds totally online and you will be guided stepwise through the creation and uploading of your files. The system automatically converts your files to a single PDF file, which is used in the peer-review process.

As part of the Your Paper Your Way service, you may choose to submit your manuscript as a single file to be used in the refereeing process. This can be a PDF file or a Word document, in any format or lay-out that can be used by referees to evaluate your manuscript. It should contain high enough quality figures for refereeing. If you prefer to do so, you may still provide all or some of the source files at the initial submission. Please note that individual figure files larger than 10 MB must be uploaded separately.

#### **References**

There are no strict requirements on reference formatting at submission. References can be in any style or format as long as the style is consistent. Where applicable, author(s) name(s), journal title/book title, chapter title/article title, year of publication, volume number/book chapter and the article number or pagination must be present. Use of DOI is highly encouraged. The reference style used by the journal will be applied to the accepted article by Elsevier at the proof stage. Note that missing data will be highlighted at proof stage for the author to correct.

#### **Formatting requirements**

There are no strict formatting requirements but all manuscripts must contain the essential elements needed to convey your manuscript, for example Abstract, Keywords, Introduction, Materials and Methods, Results, Conclusions, Artwork and Tables with Captions.

If your article includes any Videos and/or other Supplementary material, this should be included in your initial submission for peer review purposes.

Divide the article into clearly defined sections.

Please ensure the text of your paper is double-spaced—this is an essential peer review requirement.

#### **Figures and tables embedded in text**

Please ensure the figures and the tables included in the single file are placed next to the relevant text in the manuscript, rather than at the bottom or the top of the file.

The corresponding caption should be placed directly below the figure or table.

#### **Peer review**

This journal operates a single anonymized review process. All contributions will be initially assessed by the editor for suitability for the journal. Papers deemed suitable are then typically sent to a minimum of two independent expert reviewers to assess the scientific quality of the paper. The Editor is responsible for the final decision regarding acceptance or rejection of articles. The Editor's decision is final. Editors are not involved in decisions about papers which they have written themselves or have been written by family members or colleagues or which relate to products or services in which the editor has an interest. Any such submission is subject to all of the journal's usual procedures, with peer review handled independently of the relevant editor and their research groups. More information on types of peer review.

## **REVISED SUBMISSIONS**

### **Use of word processing software**

Regardless of the file format of the original submission, at revision you must provide us with an editable file of the entire article. Keep the layout of the text as simple as possible. Most formatting codes will be removed and replaced on processing the article. The electronic text should be prepared in a way very similar to that of conventional manuscripts (see also the Guide to Publishing with Elsevier). See also the section on Electronic artwork.

To avoid unnecessary errors you are strongly advised to use the 'spell-check' and 'grammar-check' functions of your word processor.

### **Article structure**

Subdivision - numbered sections

Divide your article into clearly defined and numbered sections. Subsections should be numbered 1.1 (then 1.1.1, 1.1.2, ...), 1.2, etc. (the abstract is not included in section numbering). Use this numbering also for internal cross-referencing: do not just refer to 'the text'. Any subsection may be given a brief heading. Each heading should appear on its own separate line.

### **Introduction**

State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results.

### **Material and methods**

Provide sufficient details to allow the work to be reproduced by an independent researcher. Methods that are already published should be summarized, and indicated by a reference. If quoting directly from a previously published method, use quotation marks and also cite the source. Any modifications to existing methods should also be described.

### **Theory/calculation**

A Theory section should extend, not repeat, the background to the article already dealt with in the Introduction and lay the foundation for further work. In contrast, a Calculation section represents a practical development from a theoretical basis.

### **Results**

Results should be clear and concise.

## **Discussion**

This should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations and discussion of published literature.

## **Conclusions**

The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section.

## **Appendices**

If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: Eq. (A.1), Eq. (A.2), etc.; in a subsequent appendix, Eq. (B.1) and so on. Similarly for tables and figures: Table A.1; Fig. A.1, etc.

## **Essential title page information**

- **Title.** Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible.
- **Author names and affiliations.** Where the family name may be ambiguous (e.g., a double name), please indicate this clearly. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name, and, if available, the e-mail address of each author. The title page is to be the first page of the manuscript; the second page is the abstract with key words.
- **Corresponding author.** Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. Ensure that telephone and fax numbers (with country and area code) are provided in addition to the e-mail address and the complete postal address.
- **Present/permanent address.** If an author has moved since the work described in the article was done, or was visiting at the time, a "Present address" (or "Permanent address") may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

## **Highlights**

Highlights are mandatory for this journal as they help increase the discoverability of your article via search engines. They consist of a short collection of bullet points that capture the novel results of your research as well as new methods that were used during the study (if any). Please have a look at the example Highlights. Highlights should be submitted in a separate editable file in the online submission system. Please use 'Highlights' in the file name and include 3 to 5 bullet points (maximum 85 characters, including spaces, per bullet point).

## **Abstract**

A concise (no more than 200 words) and factual abstract is required. This should be on a separate page following the title page and should not contain reference citations. Graphical abstract

Although a graphical abstract is optional, its use is encouraged as it draws more attention to the online article. The graphical abstract should summarize the contents of the article in a concise, pictorial form designed to capture the attention of a wide readership. Graphical abstracts should be submitted as a separate file in the online submission system. Image size: Please provide an image with a minimum of 531 × 1328 pixels (h × w) or proportionally more. The image should be readable at a size of 5 × 13 cm using a regular screen resolution of 96 dpi. Preferred file types: TIFF, EPS, PDF or MS Office files. You can view Example Graphical Abstracts on our information site.

### **Keywords**

Immediately after the abstract, provide a maximum of 6 keywords, using American spelling and avoiding general and plural terms and multiple concepts (avoid, for example, 'and', 'of'). Be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. These keywords will be used for indexing purposes.

### **Abbreviations**

Define abbreviations that are not standard in this field in a footnote to be placed on the first page of the article. Such abbreviations that are unavoidable in the abstract must be defined at their first mention there, as well as in the footnote. Ensure consistency of abbreviations throughout the article.

### **Acknowledgements**

Collate acknowledgements in a separate section at the end of the article before the references and do not, therefore, include them on the title page, as a footnote to the title or otherwise. List here those individuals who provided help during the research (e.g., providing language help, writing assistance or proof reading the article, etc.).

### **Formatting of funding sources**

List funding sources in this standard way to facilitate compliance to funder's requirements:

Funding: This work was supported by the National Institutes of Health [grant numbers xxxx, yyyy]; the Bill & Melinda Gates Foundation, Seattle, WA [grant number zzzz]; and the United States Institutes of Peace [grant number aaaa].

It is not necessary to include detailed descriptions on the program or type of grants and awards. When funding is from a block grant or other resources available to a university, college, or other research institution, submit the name of the institute or organization that provided the funding.

If no funding has been provided for the research, it is recommended to include the following sentence:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### **Math formulae**

Please submit math equations as editable text and not as images. Present simple formulae in line with normal text where possible and use the solidus (/) instead of a



horizontal line for small fractional terms, e.g., X/Y. In principle, variables are to be presented in italics. Powers of e are often more conveniently denoted by exp. Number consecutively any equations that have to be displayed separately from the text (if referred to explicitly in the text).

### **Footnotes**

Footnotes should be used sparingly. Number them consecutively throughout the article. Many word processors build footnotes into the text, and this feature may be used. Should this not be the case, indicate the position of footnotes in the text and present the footnotes themselves separately at the end of the article.

### **Tables**

Please submit tables as editable text and not as images. Tables can be placed either next to the relevant text in the article, or on separate page(s) at the end. Number tables consecutively in accordance with their appearance in the text and place any table notes below the table body. Be sparing in the use of tables and ensure that the data presented in them do not duplicate results described elsewhere in the article. Please avoid using vertical rules and shading in table cells.

### **References**

#### **Citation in text**

Please ensure that every reference cited in the text is also present in the reference list (and vice versa). Any references cited in the abstract must be given in full. Unpublished results and personal communications are not recommended in the reference list, but may be mentioned in the text. If these references are included in the reference list they should follow the standard reference style of the journal and should include a substitution of the publication date with either 'Unpublished results' or 'Personal communication'. Citation of a reference as 'in press' implies that the item has been accepted for publication.

#### **Web references**

As a minimum, the full URL should be given and the date when the reference was last accessed. Any further information, if known (DOI, author names, dates, reference to a source publication, etc.), should also be given. Web references can be listed separately (e.g., after the reference list) under a different heading if desired, or can be included in the reference list.

#### **Data references**

This journal encourages you to cite underlying or relevant datasets in your manuscript by citing them in your text and including a data reference in your Reference List. Data references should include the following elements: author name(s), dataset title, data repository, version (where available), year, and global persistent identifier. Add [dataset] immediately before the reference so we can properly identify it as a data reference. The [dataset] identifier will not appear in your published article.

#### **Preprint references**

Where a preprint has subsequently become available as a peer-reviewed publication, the formal publication should be used as the reference. If there are preprints that are

central to your work or that cover crucial developments in the topic, but are not yet formally published, these may be referenced. Preprints should be clearly marked as such, for example by including the word preprint, or the name of the preprint server, as part of the reference. The preprint DOI should also be provided.

### **References in a special issue**

Please ensure that the words 'this issue' are added to any references in the list (and any citations in the text) to other articles in the same Special Issue.

### **Reference management software**

Most Elsevier journals have their reference template available in many of the most popular reference management software products. These include all products that support Citation Style Language styles, such as Mendeley. Using citation plug-ins from these products, authors only need to select the appropriate journal template when preparing their article, after which citations and bibliographies will be automatically formatted in the journal's style. If no template is yet available for this journal, please follow the format of the sample references and citations as shown in this Guide. If you use reference management software, please ensure that you remove all field codes before submitting the electronic manuscript. More information on how to remove field codes from different reference management software.

### **Reference formatting**

There are no strict requirements on reference formatting at submission. References can be in any style or format as long as the style is consistent. Where applicable, author(s) name(s), journal title/book title, chapter title/article title, year of publication, volume number/book chapter and the article number or pagination must be present. Use of DOI is highly encouraged. The reference style used by the journal will be applied to the accepted article by Elsevier at the proof stage. Note that missing data will be highlighted at proof stage for the author to correct. If you do wish to format the references yourself they should be arranged according to the following examples:

### **Reference style**

**Text:** Citations in the text should follow the referencing style used by the American Psychological Association. You are referred to the Publication Manual of the American Psychological Association, Seventh Edition, ISBN 978-1-4338-3215-4, copies of which may be ordered online.

**List:** references should be arranged first alphabetically and then further sorted chronologically if necessary. More than one reference from the same author(s) in the same year must be identified by the letters 'a', 'b', 'c', etc., placed after the year of publication.

## Appendix E: Quality Appraisal Form (JBI)

JBI Critical Appraisal Checklist (Moola et al., 2020) adapted to exclude items 1, 2, 6, and 10.

### JBI CRITICAL APPRAISAL CHECKLIST FOR COHORT STUDIES

Reviewer \_\_\_\_\_ Date \_\_\_\_\_

Author \_\_\_\_\_ Year \_\_\_\_\_ Record Number \_\_\_\_\_

	Yes (1)	No (0)	Unclear (0)	Not applicable
1. Were the two groups similar and recruited from the same population?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2. Were the exposures measured similarly to assign people to both exposed and unexposed groups?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3. Was the exposure measured in a valid and reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Were confounding factors identified?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Were strategies to deal with confounding factors stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7. Were the outcomes measured in a valid and reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Was the follow up time reported and sufficient to be long enough for outcomes to occur?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was follow up complete, and if not, were the reasons to loss to follow up described and explored?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Were strategies to address incomplete follow up utilized?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:    Include        Exclude        Seek further info   

Comments (Including reason for exclusion)

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