

Please cite the Published Version

Worthington, R and Wheeler, S (2023) Hyperfocus and offending behaviour: a systematic review. *Journal of Forensic Practice*, 25 (3). pp. 185-200. ISSN 2050-8794

DOI: <https://doi.org/10.1108/JFP-01-2022-0005>

Publisher: Emerald

Version: Accepted Version

Downloaded from: <https://e-space.mmu.ac.uk/636519/>

Usage rights:  [Creative Commons: Attribution-Noncommercial 4.0](https://creativecommons.org/licenses/by-nc/4.0/)

Additional Information: This author accepted manuscript is deposited under a Creative Commons Attribution Non-commercial 4.0 International (CC BY-NC) licence. This means that anyone may distribute, adapt, and build upon the work for non-commercial purposes, subject to full attribution. If you wish to use this manuscript for commercial purposes, please visit <https://marketplace.copyright.com/rs-ui-web/mp>

Enquiries:

If you have questions about this document, contact openresearch@mmu.ac.uk. Please include the URL of the record in e-space. If you believe that your, or a third party's rights have been compromised through this document please see our Take Down policy (available from <https://www.mmu.ac.uk/library/using-the-library/policies-and-guidelines>)

The effects of Hyperfocus on offending behaviour in adults/adolescents and how effective are interventions for this? A Systematic Review

Authors:

Rachel Worthington

Department of Psychology, Faculty of Health and Education, Manchester Metropolitan University, Manchester, UK.

Department of Psychology, University of Central Lancashire, Preston, UK

Email: r.worthington@mmu.ac.uk

Suzanne Wheeler

Department of Psychology, Faculty of Health and Education, Manchester Metropolitan University, Manchester, UK

Email: s.wheeler@mmu.ac.uk

Keywords: Hyperfocus; Offending; Behaviour; Adults; Adolescents; Interventions

Abstract:

Purpose: Hyperfocus [HF] is characterized by an intense state of concentration/focus. The purpose of this systematic review was to explore in what ways HF has been found to contribute towards offending behaviour and what treatments have been found to be efficacious to reduce offending behaviour where HF was a contributing factor.

Design/Methodology: The Systematic Review was conducted following the standards by the Centre for Evidence-Based Management (CEBMA; Barends *et al.*, 2017).

Findings: Two review authors independently screened abstracts to determine relevance. Papers were screened for quality appraisal and risk of bias. The initial search yielded 207 articles

with an additional 56 articles identified through other sources. 4 papers were deemed as meeting the inclusion criteria. The results identified themes in relation to the mechanisms by which HF may contribute to offending and suggested interventions for HF and offending.

Originality: This review noted that although HF has been postulated as being an important contributing factor to offending behaviour few studies have tested this directly. From the limited studies available HF was found to be relevant across different types of offences. HF was noted to contribute to offending due to neuropsychological mechanisms linked to executive functioning deficits and positive rewards associated with offending behaviour. Reasons for the lack of HF research are noted and recommendations for future research are discussed.

Introduction:

According to Ashinoff and Abu-Akel (2021) 'Hyperfocus' "is a phenomenon that reflects one's complete absorption in a task, to a point where a person appears to completely ignore or 'tune out' everything else" (pp1). Thus it is viewed as a factor which contributes to difficulties in switching attention. Furthermore, hyperfocus [HF] is characterised by behaviour such as sustained attention in a task which is deemed as interesting or rewarding and with a reduced focus on non-task relevant stimulus resulting in increased attention on the rewarding task. According to Hupfeld *et al* (2019) the characteristics of HF include: poor time monitoring and engaging in a task for long periods without noticing the passing of time; poor attendance to stimuli outside of the task (e.g. someone calling the person's name); poor attendance to personal needs (e.g. not noticing they are hungry); difficulty in undertaking an alternative necessary but less interesting task; feeling totally immersed in the task; and procrastinating about specific details.

Traditionally research into HF has focussed on clients with ADHD (Hupfield *et al.*, 2019; Sklar, 2013) and Autism (Geurts *et al.*, 2009) whereby increased attention was observed when engaging in a rewarding task with difficulties switching to non-rewarding tasks. However, it has also been postulated that HF has also been associated with hypersexuality (Hallowell and Ratey, 1994), compulsive sexual behaviours such as indecent exposure,

voyeurism and offending against children (Blanchard and Tabachnick, 2002). HF has also been associated with engaging in Intimate Partner Violence (IPV) in terms of the person hyperfocussing on aspects of the victim's behaviour (van Outsem, 2011). In addition, Al-Attar (2020) also proposed HF may place a person with ASD at an increased risk of engaging in acts of terrorism.

The links between HF and offending have also been discussed in relation to brain functioning. For example, Corrado and Mathesius (2014) discussed how reduced attentional and self-control in adolescents can intensify the reward-centred parts of the brain resulting in reduced consequential thinking when considering dissocial behaviour. The authors suggested that the neurological and hormonal profiles in adolescents and adults with difficulties such as personality disorder result in HF on rewards and reduced attendance to non-reward stimulus or consequences. Kotler and McMahon (2005) also noted how this combination of reduced attendance to consequences and heightened focus on rewards was also related to psychopathy. They suggest this is due to under-activity in the behaviour inhibition system (BIS) leading to an increased focus on reward and reduced sensitivity to punishment (Kotler and McMahon, 2005). O'Brien and Frick (1996) also found in their study that children with callous/unemotional traits engaged in HF on rewards and attended less to cues of punishment.

In terms of the neurological processes underpinning HF, Murray (2019) notes that it has been argued that HF may contribute towards anti-social behaviour through deficits in the behavioural activation system (BAS)[the mechanism which encourages approaching reward systems] and the behavioural inhibition system (BIS)[the mechanism to inhibit behaviours that result in aversive consequences]. For example, Quay (1993) suggested that anti-social behaviour was due to over-active BAS systems which Murray (2019) proposed leads to HF and an over-attention to rewards. However, it was also noted that HF may be noted due to under-active BAS systems whereby the person engages in sensation seeking to counteract the underactive system (Zuckerman, 1996; Murray, 2019).

Yildirim (2016) also noted that HF may be linked with antisocial behaviour due to a lower flexibility in PFC mediated executive processing leading to an increased reward-HF,

impulsivity and 'sociopathic' behaviours. Thus, reduced PFC functioning is hypothesized to be linked with inducing Hf and attendance to rewards at the expense of attending to warning cues or information suggesting behaviour inhibition should be activated and increased impulsive responding (Wallace and Newman, 2008).

Thus, there is a theoretical basis upon which HF has been linked with offending, however, what is unclear is to what extent this theoretical basis has been empirically tested and what the outcomes of the research indicate for treatment. Thus, the purpose of this systematic review is to explore what are the effects of HF on offending behaviour and what interventions have been shown to be effective for the treatment of HF in clients engaging in offending behaviour. Due to the literature base attending to theories for both adults and adolescents this systematic review will answer the aforementioned questions for both adults and adolescents.

OBJECTIVES

To determine in what way HF may be associated with and/or contribute to offending behaviour in adults and adolescents and what interventions may be helpful to reduce HF and offending. The following questions were considered in conducting the review:

Primary Research Questions

- 1) What are the mechanisms through which HF may be linked with offending behaviour?
- 2) What types of offending behaviour are impacted by HF?
- 3) What interventions for HF reduce offending behaviour?

Method

This systematic review was performed according to the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and was registered in the International Prospective Register of Systematic Reviews (PROSPERO) in 2021.

Search Strategy - The Systematic Review was conducted following the standards by the Centre for Evidence-Based Management (CEBMA; Barends *et al.*, 2017). The following databases were searched: Cochrane Library; Embase; Medline (via OVID); Medline (via PubMed); Ovid; PsychINFO; SCOPUS; and Google Scholar. Searches were limited to those published in English. Keywords used in the search included:

'Hyperfocus*' OR 'Hyper-focus*'

AND

'offen*' OR 'aggress*' OR 'sex*' OR 'fire*' OR 'crim*' OR 'violen*' OR 'assault*' OR 'behav*'

Inclusion Criteria

The criteria for inclusion was selected using the PICOC (patient, intervention comparison, outcome and context). See table 1

INSERT TABLE 1

Quality appraisal: Papers were screened following the guidelines recommended by Barends, *et al* (2017) whereby each paper was assigned a validity rating from AA (e.g. representing the gold standard such as systematic reviews) to the lowest level E (case studies, case reports and anecdotal data). Papers were then assessed using the Cohort Study Checklist by the Critical Appraisal Skills Programme (CASP). The 12-item tool guides the assessor systematically through the appraisal, enabling critical reflection of each study's results (Barends *et al.*, 2017). See Table 2.

INSERT TABLE 2

Data extraction: Two reviewers independently screened the data for inclusion and were blinded to each other's decision. The study selection was informed by using the Critical Appraisal Skills Programme (CASP) checklist and the Appraisal tool for Cross-Sectional Studies (AXIS). Data extracted included participant type and sample size, the study aims, methodology, measures used, outcome data, strengths and limitations and key findings. One researcher independently extracted the data and the second researcher checked the extracted data. The data was recorded in an excel spread sheet.

Risk of Bias: The risk of bias was assessed using AMSTAR 2 (Shea *et al.*, 2017). Two reviewers independently undertook the risk of bias assessment in order to ensure the judgement was not influenced by a single researcher's preconceptions.

Data Synthesis: The characteristics of the studies were tabulated to include examination of their content and any other relevant characteristics. The studies were then grouped based on characteristics using a matrix to determine similarities worthy of grouping. This was then used to synthesize the characteristics of the studies contributing to each comparison (e.g. type of offence, age, severity of HF, pharmacological intervention, psychological therapy etc). Studies addressed a variety of research questions, and employed heterogeneous range of measurement approaches and analytic techniques. As a result, meta-analysis was not feasible. Hence, a structured reporting of the effects (rather than statistical synthesis) was adopted based on the Cochrane Guidance that if the data is heterogeneous and cannot be synthesised using mathematical procedures then a narrative synthesis should be adopted. This was conducted following the MECIR standards for reporting of reviews using narrative synthesis and the Guidance on the Conduct of Systematic Reviews in (Popay *et al.*, 2006). (See Table 4)

INSERT TABLE 4

Results/Discussion

Description of the Included Studies

All potentially relevant articles were exported into EndNote (www.endnote.com) for de-duplication. The title and abstract of articles were screened by the first and second authors to assess whether they were relevant for review. The initial search yielded 207 articles with an additional 37 articles identified through other sources. 14 duplicates were removed leaving a total of 230 papers which were reviewed for relevancy. 199 articles were removed as they did not include offending behaviour and HF. 31 articles were fully read to assess if they met the inclusion criteria. Out of these, 27 papers were excluded: N=10 were discussion papers and did not utilise research methods; N= 10 referenced HF but not offending behaviours; N = 1 had a sample size aged 9-11 and thus were below the cut off age of 10; N =4 did not attend to HF; N = 1 discussed HF in victims of offending; and N = 1 was a dissertation chapter which replicated a published study included. 4 papers were deemed as meeting the inclusion criteria (See Figure 1).

INSERT FIGURE 1

Description of the study characteristics

Two of the studies were published in 2015 and two in 2020. The studies explored aggression (N=2), Terrorism (N=1) and viewing images of child abuse (N=1). Female and Male participants were included in two of the studies and sample sizes ranged from N = 20-62 with an additional meta-analysis. Two studies identified the ethnicity of participants. In one study N=11 identified as White British and N=1 identified as from a Black, Asian or Minority Ethnic background. In the other study there were equal numbers of 'Caucasian' and 'African-American' individuals (47% and 44%, respectively). 2 studies did not identify the ethnicity of participants. One study used quantitative analysis and 3 used qualitative

analysis (Thematic, IPA and qualitative meta-analysis). Of those, 2 studies included participants with convictions for offending and 1 used people who were not convicted. The meta-analytic study did not identify if participants were convicted. (See Table 3)

INSERT TABLE 3

Key findings

(1) Walter *et al* (2020) explored how core autistic traits may make individuals susceptible to adopting radical ideology. They adopted a qualitative method of semi-structured interviews of 34 participants (N=22 professionals and N=12 young people with autism between the ages of 14-19). 4 themes emerged from their research: 1) a lack of research to confirm any link between ASD and radicalisation; 2) the need for enhanced training for staff working with clients with ASD and how radicalisation may present in this client group; 3) key autistic traits which increased susceptibility to autism; and 4) social and cultural considerations. Hyperfocus was identified as a contributory factor in theme 3 whereby it was identified by participants that radical groups may align with the special interests of people with autism who have a particular hyperfocus on a topic. The paper identified that participants highlighted striking a balance between not assuming interests are ideologically driven and that autism in itself is not a risk factor for radicalisation but facets and characteristics (including hyperfocus) may increase vulnerability. The paper makes recommendations for targeting hyperfocus through not seeking to suppress the interest but creating a more balanced view in these clients through mentoring.

(2) Knack *et al* (2020) explored the motivation for the onset of and maintenance of viewing images of child abuse on the internet. Participants were N=20 males between the ages of 28 and 70 years old who were receiving treatment at an outpatient psychiatric treatment centre as a result of being charged or convicted (N=18) or seeking help voluntarily (N=2) for recurrent viewing of internet based child pornography. The study adopted a qualitative design (IPA) identifying 4 themes: 1) Sexual Gratification; 2) Emotional Self-Regulation; 3) Behavioural Facilitation; 4) Behavioural Maintenance. Hyperfocused sexual arousal was identified in theme 3 whereby HF was noted to result in participants reduced attendance to the potentially negative consequences of engaging in viewing child pornography as well as the negative emotions (such as shame and guilt) associated with this. The study

recommended that education on the potential effects of persistent sexual arousal may help clients with HF improve their ability to manage their arousal.

(3) Verona and Bresin (2015) conducted a quantitative study exploring the interplay between negative valence and cognitive system functioning and aggression/violence. The authors proposed that aggression proneness may be understood by neural processes. Specifically they hypothesized that hyperfocus can produce a sustained sensitivity to threat because of the heightened attention to threats and increased anger rumination resulting in reduced cognitive control and reduced inhibition thus leading to aggression. In order to test this hypothesis the authors presented participants with the aggression questionnaire (AQ, Buss & Warren, 2000), and an emotional linguistic go/no go task requiring participants to respond to words or inhibit responses depending on the font type. The words used were categorised as: emotionally neutral; generally negative; or offender relevant negative. Physiological data was captured using an electro-cap. The sample consisted of N=67 males and females with convictions for aggression and violence. Of these, N=15 scored high (equal or above 18) on psychopathy (as measured by the screening version of the Psychopathy Checklist [PCL:SV]). N=31 scored low (equal to or less than 12) and N=21 scored intermediately (over 12 and less than 18). The data was analysed using statistical analyses (ANOVA). The study found that participants scoring higher for aggression proneness had reduced go/no-go differentiation during the offender relative negative word trials. They also found that reduced processing of 'no-go' (cues measuring inhibition) were specific to the offender relevant negative word blocks. In summary the researchers concluded that participants who scored higher on aggression proneness, measured using the Aggression Questionnaire, showed reduced Go/No-Go differentiation during the offender-relevant negative word blocks, suggestive of reduced processing of inhibitory cues in the context of salient threat. The authors recommended that more research was required in relation to exploring how attentional biases towards threat cues may impact on aggression.

(4) Yildirim and Derksen (2015) conducted a qualitative meta-analysis of the literature in relation to dopamine functioning related to psychopathy, specifically focussing on how this could impact on risk taking, attendance to short term rewards, aggression and criminality. Specifically they found that the research showed that people with psychopathy who engaged in more criminal and impulsive behaviours had less flexible cognitive processes

which led to a more automatic hyperfocus on short-term novel rewards. This was specifically related to a reduction of PFC grey matter and hippocampal abnormalities when compared to non-convicted and/or non-incarcerated clients with psychopathy. They also found that pathologically elevated activity of striatal dopamine neurons may result in traits such as risk taking, aggression, reward hyperfocus and irresponsibility but only in clients who were emotionally resilient and fearless. In clients who were emotionally unstable and fearful this resulted in anxiety, paranoia and harm-avoidance. They also found that high tonic dopamine hyperactivity in the limbic structures dampened the feedback to the prefrontal cortex and resulted in hyperfocus on rewards, risk taking and disinhibition in clients with psychopathy. High tonic/high population DA activity (with down-regulated D2 receptors) may also increase attentional hyperfocus in clients with psychopathy which was associated with higher risk taking, and stimulant intoxication. D1 receptors were also associated with provoking attentional hyperfocus. The authors hypothesized that people with disinhibited psychopathy have lower levels of synaptic dopamine prefrontal cortex activity and D1 to D2 type receptor ratios which impairs focus on long term goals and increased reward hyperfocus. They recommended that more research should be undertaken to test this hypothesis. In summary the authors concluded that impaired dopamine driven stabilisation and reduced prefrontal cortex neural circuits labilization resulted in higher hyperfocus and obsessionality, impaired cognitive flexibility to non-rewards or punishment. The authors also noted that pharmacological interventions targeting the regulation of dopamine (such as Clozapine) could be used to improve cognitive stability and control of focus on immediate rewards. However, they also note that whilst this may target reward hyperfocus it may also result in the client presenting with a more controlled form of psychopathy. Thus, the use of clozapine would inhibit the impulsive aspect of psychopathy but not other aspects. The authors also propose other interventions such as applied neurofeedback could be helpful to support brain arousal regulation.

What are the mechanisms through which HF may be linked with offending behaviour?

All of the papers attended to how HF impacted on executive functioning skills thus contributing to offending behaviour. For example, HF was identified as being linked to repetitive and restricted interests in clients with autism (a neurodevelopmental disorder)

(1). In addition, neurological processes associated with HF were noted to be linked with aggression threat responses (3) with specific regions of the brain being linked to HF for both aggression and criminality (4). Specifically, HF appeared to contribute to reduced inhibition (4) (3) (2), reduced attention to long term negative consequences (4) (3), reduced cognitive flexibility (4) and heightened attention to short term immediate rewards (4) (2). Thus, HF was considered to contribute to neurological processing and brain functioning reducing the capacity for executive functioning and thus increasing the risk of offending behaviour.

However, these factors alone did not account for why HF was linked with offending behaviour per se. A secondary theme identified in the papers did attend to this whereby 3 of the papers identified the function that HF may serve to the individual in terms of positive and negative reinforcement. HF was identified as acting as a negative reinforcer for aggression in terms of acting as a heightened protection to fear of harm (3). HF was found to facilitate heightened attention to threats and increased anger rumination and aggression responses as a means of offsetting perceived risk of harm (3). HF was also identified as having a positive reinforcing function (4) in terms of allowing the person to attend to the pleasure of immediate HF rewards such as sexual arousal (2) and sensory arousal to special interests (1). HF was also noted to facilitate bypassing cognitive processes which would ordinarily be associated with societal shame (2), reducing inhibitory processes (3) and ignoring negative long term consequences (2). One paper (2) attended to how HF was not necessarily driven by cognitive processes that were compatible with positive short term rewards. For example, the paper described how after the HF behaviour the person may feel shame and guilt because they did not cognitively endorse the behaviour to be acceptable. Thus HF may contribute towards offending behaviour because it facilitates a reduction in attendance to cognitive and societal factors which may deem the behaviour unacceptable and instead facilitates attendance to internal reward states.

However, all of the papers emphasized that HF alone did not explain offending behaviour, rather HF acted as a contributory or vulnerability factor when other offence related factors were already present. These included HF being combined with rumination contributing towards aggression (3), HF and offence related special interests such as radicalisation (1) and sexual arousal to children (2) and psychopathy (3) (4). Thus, HF was regarded by all of

the papers as acting as a vulnerability factor rather than a single factor that explains offending.

What types of offending behaviour are impacted by HF?

HF was noted to act as a vulnerability factor for aggression (3) (4), sexual offending (2) and risk of radicalisation (1). HF was also observed in clients with psychopathy (3) (4), autism (1) and those without a diagnosis (2) (3). No differences were also observed between males and females (3). Thus, HF was not found to be offence, diagnosis or gender specific.

What interventions for HF reduce offending behaviour?

All of the papers made recommendations for how people engaging in HF could be supported using interventions. These included improving coping strategies and skills for managing HF (2) providing psycho-education on the potential negative effects of HF such as the impact of viewing images of child abuse (2) and expanding alternative pro-social interests for the individual to HF on (1). Acknowledging the potential neuropsychological underpinnings of HF, one paper (4) also identified the potential use of medication to regulate the dopamine system to reduce HF. Other neuropsychological interventions such as applied neurofeedback (4) were also proposed with the aim of providing the person with feedback on their brain arousal system. However, all of these were suggestions and none had been empirically tested.

Limitations and Future Directions

The aim of this paper was to explore what the effects of HF are on offending behaviour and what interventions have been found to be helpful to reduce HF and offending. This is important because HF has been postulated as having an important role in contributing towards offending behaviour. To examine this, empirical studies only were included in the review (rather than ideological or intuition based papers). Only 4 studies met the criteria for inclusion with only one study adopting a quantitative method and the remaining 3 papers having small numbers of participants (N = 20-62) and adopting qualitative analysis. Thus, the limited generalisability of the findings should be noted. One of the reasons for the lack of empirical studies may be due to the absence of previously validated tools for the assessment of HF. For example, the Adult Hyperfocus Questionnaire (Hupfield *et al.*, 2018)

has only recently been developed and validated, thus it is possible that the absence of research on HF and offending may be explained by a lack of a previously reliable method for measuring HF.

Three distinct questions were examined in this review: (1) What are the mechanisms through which HF may be linked with offending behaviour? (2) What types of offending behaviour are impacted by HF? (3) What interventions for HF reduce offending behaviour?

Narrative Synthesis was conducted due to the high heterogeneity. The limited preliminary findings provided support for the hypothesis that HF contributes towards offending as HF reflects specific impairments in neurological processing and brain functioning. HF was not specific to a 'type' of offending behaviour because it was associated with specific deficits in executive functioning rather than offence specific risk factors. However, none of the proposed interventions for HF to reduce offending behaviour had been empirically tested.

Summary of Critical Findings:

- HF alone does not explain offending but may increase vulnerability
- HF is linked to deficits in executive functioning
- HF serves as both a positive and negative reinforce in offending
- HF impedes the ability to consider long term consequences
- The link between HF and offending is heterogeneous

This systematic review provides evidence for the lack of empirical research on HF and offending. Thus, there is a sizeable gap in the literature which may warrant further research. For example, HF is a noted feature of ADHD and ADHD is associated with higher rates of reoffending in adults (Young, Wells & Gudjonsson, 2011). Hence, ADHD is disproportionately represented in prison populations with meta-analytic studies indicating that 25.5% of the prison population met the diagnostic cut off for ADHD (Young *et al.*, 2015). As noted by Young *et al* (2018) this amounts to approximately 2.8 million prisoners worldwide meeting the diagnostic criteria for ADHD. It is noteworthy that none of the papers that met the criteria for inclusion for HF related to clients with ADHD. Thus, what is unclear is to what extent HF may contribute to offending both in this client group and other populations where HF is a feature and what the causal mechanisms are surrounding this.

Further research is needed to better understand the ways in which HF may contribute to offending behaviour as well as any moderating protective factors. This could provide better insight into potential causal pathways of HF in offending to clarify what interventions may be of benefit to reduce HF associated offending. For example, as HF is understood as a neurological factor if this plays a contributing role to offending, then practitioners may wish to attend to HF in order to adhere to the responsivity principle of Risk-Need-Responsivity [RNR] in terms of modifying training, programmes and interventions for this client group. However, at present there is an insufficient research base upon which this could be considered. Future studies would benefit from using clearer definitions and measures of HF with controlled designs and larger samples. Methodologically robust qualitative research could also explore the experiences of people with HF who have engaged in offending behaviour to better understand the potential causal mechanisms of HF.

Implications

- Practitioners working with clients with HF currently lack evidence on the extent to which this contributes towards offending and recidivism and how HF could be addressed in interventions.
- Future research is needed to establish the role of HF in offending behaviour. Ideally this should involve longitudinal data collection, retrospective analysis of data and sophisticated statistical analysis. This should also include exploration of the ways in which HF may be interconnected with offence risks/need factors which contribute towards offending.
- Research could inform the development of formal measurement tools for HF which are validated with norms for adult and adolescent offender samples.
- Practitioners should use case formulation to explore if HF represents a treatment need for clients they are working with.

References

Al-Attar, Z., 2020. Autism spectrum disorders and terrorism: how different features of autism can contextualise vulnerability and resilience. *The Journal of Forensic Psychiatry & Psychology*, 31(6), pp.926-949.

Ashinoff, B.K. and Abu-Akel, A., 2019. Hyperfocus: the forgotten frontier of attention. *Psychological research*, pp.1-19.

Barends, E., Rousseau, D.M. and Briner, R.B., 2017. CEBMa guideline for rapid evidence assessments in management and organizations (version 1.0). Retrieved from *Stiching Center for Evidence Based Management*: <https://www.cebma.org/wp-content/uploads/CEBMA-REA-Guideline.pdf>, p.38.

Blanchard, G. and Tabachnick, J., 2002. The prevention of sexual abuse: Psychological and public health perspectives. *Sexual Addiction & Compulsivity: The Journal of Treatment and Prevention*, 9(1), pp.1-13.

Critical Appraisal Skills Programme. CASP Randomised Controlled Trial Checklist. <http://www.casp-uk.net/casp-tools-checklists>. Accessed July 2021.

Corrado, R. and Mathesius, J., 2014. Developmental psycho-neurological research trends and their importance for reassessing key decision-making assumptions for children, adolescents, and young adults in juvenile/youth and adult criminal justice systems. *Bergen Journal of Criminal Law & Criminal Justice*, 2(2), pp.141-163.

Geurts, H.M., Corbett, B. and Solomon, M., 2009. The paradox of cognitive flexibility in autism. *Trends in cognitive sciences*, 13(2), pp.74-82.

Hallowell Edward, M. and Ratey John, M., 1994. Driven to Distraction: Recognizing and Coping with Attention Deficit Disorder from Childhood Through Adulthood.

Hupfeld, K.E., Abagis, T.R. and Shah, P., 2019. Living “in the zone”: hyperfocus in adult ADHD. *ADHD Attention Deficit and Hyperactivity Disorders*, 11(2), pp.191-208.

Knack, N., Holmes, D. and Fedoroff, J.P., 2020. Motivational pathways underlying the onset and maintenance of viewing child pornography on the Internet. *Behavioral sciences & the law*, 38(2), pp.100-116.

Kotler, J.S. and McMahon, R.J., 2005. Child psychopathy: Theories, measurement, and relations with the development and persistence of conduct problems. *Clinical child and family psychology review*, 8(4), pp.291-325.

Murray, L., 2019. *Neural Mechanisms of Reward Processing in Antisocial Behavior* (Doctoral dissertation).

O'Brien, B.S. and Frick, P.J., 1996. Reward dominance: Associations with anxiety, conduct problems, and psychopathy in children. *Journal of abnormal child psychology*, 24(2), pp.223-240.

Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., Britten, N., Roen, K. and Duffy, S., 2006. Guidance on the conduct of narrative synthesis in systematic reviews. *A product from the ESRC methods programme Version, 1*, p.b92.

Quay, H. C. (1993) "The psychobiology of undersocialized aggressive conduct disorder: A theoretical perspective," *Development and Psychopathology*. Cambridge University Press, 5(1-2), pp. 165–180. doi: 10.1017/S0954579400004326.

Shea, B.J., Reeves, B.C., Wells, G., Thuku, M., Hamel, C., Moran, J., Moher, D., Tugwell, P., Welch, V., Kristjansson, E. and Henry, D.A., 2017. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. *bmj*, 358.

Sklar, R.H., 2013. *Hyperfocality in adult ADHD: An EEG study of the differences in cortical activity in resting and arousal states*. University of Johannesburg (South Africa).

van Outsem, R., 2011. The applicability of neurofeedback in forensic psychotherapy: a literature review. *Journal of Forensic Psychiatry & Psychology*, 22(2), pp.223-242.

Verona, E. and Bresin, K., 2015. Aggression proneness: Transdiagnostic processes involving negative valence and cognitive systems. *International Journal of Psychophysiology*, 98(2), pp.321-329.

Wallace, J.F. and Newman, J.P., 2008. RST and psychopathy: Associations between psychopathy and the behavioral activation and inhibition systems. *The reinforcement sensitivity theory of personality*, pp.398-414.

Walter, F., Leonard, S., Miah, S. and Shaw, J., 2021. Characteristics of autism spectrum disorder and susceptibility to radicalisation among young people: a qualitative study. *The journal of forensic psychiatry & psychology*, 32(3), pp.408-429.

Yildirim, B.O., 2016. A treatise on secondary psychopathy: psychobiological pathways to severe antisociality. *Aggression and violent behavior*, 31, pp.165-185.

Yildirim, B.O. and Derksen, J.J., 2015. Mesocorticolimbic dopamine functioning in primary psychopathy: A source of within-group heterogeneity. *Psychiatry research*, 229(3), pp.633-677.

Zuckerman, M., 1996. The psychobiological model for impulsive unsocialized sensation seeking: a comparative approach. *Neuropsychobiology*.