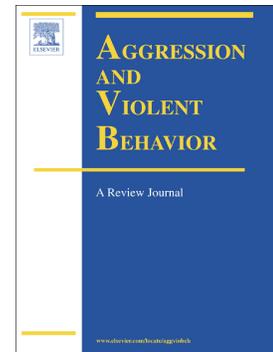


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The effect of mindfulness practice on aggression and violence levels in adults: A systematic review

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Title:

The effect of mindfulness practice on aggression and violence levels in adults: a systematic review.

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Abstract:

Violence and aggression represent a serious problem, with significant cost and impact at individual and societal level. There has been increasing interest in the potential of mindfulness interventions to decrease levels of violence and aggression. This paper systematically reviews the evidence to assess the effectiveness of mindfulness interventions for the reduction of violence and aggression levels. Five electronic databases were searched, and methods followed published guidance for systematic reviews. Studies that used a mindfulness intervention and measured outcomes of aggression and violence in adult populations were included. The Quality Assessment Tool for Quantitative Studies was utilised to evaluate the quality of included studies. Twenty-two studies met the eligibility criteria, including fourteen randomised studies, three non-randomised studies and five cohort studies. The interventions investigated included mindfulness, Acceptance and Commitment Therapy, Dialectical Behaviour Therapy and yoga with meditation.

Overall, the results suggest that mindfulness-based interventions, with the possible exception of DBT, may be effective in reducing aggression and violence. They also suggest that mindfulness may relate to the processes of aggression through emotion regulation. However, papers were of variable quality, with weaknesses in both methodology and the reporting of data. Further good quality controlled studies with full and transparent reporting are needed to confirm these results, and to explore the elements of mindfulness which interact with mechanisms of aggression.

Keywords:

Mindfulness, aggression, violence, meditation, systematic review

Conflicts of interest:

The authors declare that they have no conflicts of interest.

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1. Introduction

Violence and aggression are ongoing societal concerns, with significant costs and implications. Globally, there are significant challenges in gaining accurate understanding of these costs. In an international review, Waters et al (2005) reported interpersonal violence as having an estimated cost of 3.3% of gross domestic product (GDP) in the United States, observing that there is a scarcity of studies on the economic impact in poorer countries which are disproportionately affected by violence. In Latin America, the estimated costs due to violence were between 5 and 25% of GDP in 1997 (Waters et al 2005). In the UK, 1.3 million incidents of violence to adults were reported in the year ending March 2016 (Office for National Statistics 2016). It is estimated that in psychiatric services alone, the cost of violence (in terms of staff time and resources) equates to around £20.5 million per year (Figures for UK, NICE 2015). In addition to the number of incidents, their immediate effect and associated cost (situation management, injury, damages), the impact of violence has been shown to have longer term impact. The World Health Organisation demonstrates that victims of violence have more long-term health problems and increased health care costs (WHO 2002). The WHO also identifies lack of productivity and absenteeism in the workplace, the provision of places of safety, damage to property and infrastructure, and disincentives for tourism and investment as some of the indirect costs of violence, going so far as to say that “...violence is a leading worldwide public health problem.” (WHO 2002, p2). The impetus to address violence has increased in recent years, with the WHO Global Status Report on Violence Prevention (2014). In 2015, the United Nations General Assembly adopted the 2030 Agenda for Sustainable Development (UN 2015), which is underpinned with the themes of peace-building and violence reduction. Thus violence and aggression are recognised as serious and relevant problems, impacting negatively at individual and societal level.

The WHO defines violence as “*the intentional use of physical force or power, threatened or actual, against oneself, or against a group or community that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation*”(WHO 2014). Put more simply, aggression has been defined as “*hostile, injurious, or destructive behaviour*” (Siever 2008). Aggression may be reactive (responding to perceived threat), instrumental (for gain or reward) or appetitive (indicating an enjoyment of violence) (Elbert, Moran & Shauer 2016).

Violence is more likely to take place when we view someone as “other”, or different from ourselves. This occurs through a process of dehumanisation or depersonalisation, which then enables us to act aggressively or violently towards the “other” (Hanlon 2006). This process exists both at a macro level (national or international conflicts, as Hanlon discussed) and at a micro level, where in health and care settings for example, burnout has

been seen to increase depersonalisation, and is linked to an increased risk of abuse. (Crabbe et al 2004, Neuberg et al 2017). Violence and aggression are also impacted by rumination (Bushman 2002) and difficulties with emotion regulation (Davidson et al 2000).

A range of risk factors for violence and aggression have been identified, including poor interpersonal dynamics, insecurity, power imbalance, lack of societal acceptance, social disruption and poverty (Morris 2007) as well as health or sensory conditions, negative life events, poor communication skills, lack of meaningful activity, restricted social networks and mood disorders (Hastings 2013). In a series of papers on causes of aggression, Lee (2015, p204) comments that “*the biological cannot be separated from the psychological, social, and environmental, such that a merging of the fields is necessary for an understanding of a phenomenon as complex as human violence*”. This does not mean that single-focus strategies should not be considered, as psychological processes are crucial in the pathway between bio-socio-environmental risk factors and aggression or violence (McGuire 2008). So there is merit in exploring interventions which address psychological processes, providing they are considered as part of a wider framework of interventions, which includes awareness of the societal, political and environmental conditions within which violence is more likely.

Some strategies in recent years have focused on psycho-social interventions for people who exhibit aggressive or violent tendencies. A review shows encouraging trends in interventions such as emotional self-management, interpersonal skills, social problem-solving and allied training, but comments that results are weaker in respect of domestic violence, less consistent in relation to prisons, and that there is an overall need for better quality studies (McGuire 2008). One strategy not included in that review is mindfulness, or mindfulness-based interventions (MBIs). Mindfulness can be defined as “*paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally*” (Kabat-Zinn 1994, p4). In recent years, there has been an exponential increase in the range of MBIs available. Mindfulness in its purist form has an emphasis on regular practice (meditation) as well as translation into the scenarios of daily life. Its main focus is the development of awareness. Acceptance and commitment therapy (ACT) uses mindfulness with an additional focus on value-based action. Dialectical behaviour therapy (DBT) includes mindfulness exercises or tools as an optional element without the same emphasis on practice. While all these come under the heading of MBIs, there are differing levels of focus on mindfulness itself.

Mindfulness is of potential relevance to violence and aggression as it interconnects directly with many of the aspects and risk factors identified above. It is shown to increase the sense of connection and empathy towards

others (Hutcherson et al 2008; Condon et al 2013; Shonin et al 2015), as well as decreasing rumination and enhancing emotion regulation (Holzel 2011).

Several studies suggest that dispositional mindfulness negatively correlates with aggression and violence (Shorey et al 2015; Eisenlohr-Moul et al 2016; Borders et al 2010) and interpersonal conflict (Brown & Ryan 2003). Research has also started to explore the question as to whether mindfulness as an intervention may have an impact on levels of aggression and violence. Existing reviews have sought to understand the effect of mindfulness on various conditions such as autism (Cachia et al 2016) or psychopathology (Shonin et al 2013), and with a range of client groups such as sexual abusers (Jennings et al 2013), sometimes looking at aggression as a secondary outcome measure. Others have looked at the impact of various interventions on violence and aggression, including cognitive behavioural interventions (Ali et al 2015), school prevention programmes (Mytton et al 2006) and other non-pharmacological interventions (Rampling et al 2016). None of these reviews have focused on the effects of mindfulness specifically on levels of aggression and violence in an adult population. A critical review was conducted into dialectical behaviour therapy (DBT) and aggression (Frazier & Vela 2014), only looking at that one specific intervention. A critical review of mindfulness and aggression (Fix & Fix 2013) included single-subject studies, unpublished research, and studies including adolescents. Further studies have been conducted since publication of this critical review, and to the authors best knowledge, no systematic review has been undertaken. The aim of this systematic review is to appraise existing research in order to assess the effect of mindfulness-based interventions on levels of aggression and violence in adults.

2. Methods

The protocol for this systematic review was registered on PROSPERO as CRD42018092638. This systematic review is reported in accordance with the PRISMA recommendations for reporting systematic reviews (Moher et al 2009).

2.1 Data sources and search strategy

Electronic databases including the Cochrane library (Cochrane Database of Systematic Reviews – [CDSR], Database of Abstracts of Reviews of Effects – [DARE], Cochrane Central Database of Controlled Trials – [CENTRAL]), MEDLINE, MEDLINE In-Process, PsycINFO and Web of Science were searched from inception to 22nd March 2018. The search strategies were designed to focus on the specific interventions (i.e.

mindfulness and aggressive or violent behaviour). The search strategy for MEDLINE was as follows: Strategy used: Mindfulness/ or Meditation/ OR (mindfulness* or meditat* or MBSR* or MBCT) OR (mindfulness* adj4 Stress* adj4 Reduc*) OR (mindfulness* adj4 Cognit* adj4 Therap*) OR (accept* adj4 commit* adj4 therap*) OR (Dialect* adj4 Behavior* Therap*) OR (DBT or CFT) OR (compass* adj4 focus* adj4 therap*) OR (anapanasati or satipatthana or vipassana or samatha) AND aggression/ or agonistic behavior/ or bullying/ OR exp Violence/ OR (aggressi* or violen* or antisocial*) OR (problem* adj4 behav*) AND limit to English language AND remove duplicates AND animals/ not humans/. Search strategies were adapted to enable similar searching of the other relevant electronic databases. The reference lists of eligible studies were hand-searched to identify further potentially relevant studies. Results were uploaded to and managed using Mendeley software.

2.2 Eligibility criteria

English language randomised controlled trials (RCTs) or non-RCTs which (1) evaluated an intervention of a mindfulness based, buddhist or other awareness meditation, (2) for people aged 18 years or older, and (3) which contained a quantitative outcome measure of expressed aggression or violence towards others were included. Studies were excluded where (1) the study design was case series, cross sectional or qualitative data, (2) if the population was under the age of 18 years (or if data on people over the age of 18 years was not presented separately), (3) if there was no mindfulness/awareness intervention, (4) no quantitative measure on aggression, or (5) if data was only presented on self-harm.

Those criteria were chosen due to the intention to explore the impact of mindfulness interventions on aggression across sectors of the adult population rather than in any one single setting.

2.3 Study selection and data extraction

Titles and abstracts of all citations were screened for relevance by one reviewer, and checked by a second reviewer whenever there was any uncertainty. The full-text of potentially relevant studies was retrieved for independent assessment by two reviewers against the eligibility criteria. Any disagreements were resolved by discussion and consensus between the reviewers or consultation with a third reviewer.

A data extraction form was developed and piloted for the purposes of this review. For each included study, data were extracted by one reviewer and checked for accuracy and completeness by a second reviewer. Any disagreements were resolved by discussion and consensus between the reviewers and if necessary consultation with a third reviewer. Data extracted included the authors and date, study setting and population, participant

characteristics, study design, details of intervention and control conditions and outcome measures. In the case of missing data, study authors were contacted by email to request additional information, and followed up after one month if there was no response.

2.4 Quality assessment

The methodological quality was assessed using the “Quality Assessment Tool for Quantitative Studies” (QATQS) (Effective Public Health Practice Project 1998). Quality assessment of included studies was undertaken by two reviewers independently. Any disagreements were resolved by discussion and, if necessary, in consultation with a third reviewer.

2.5 Data analysis

Due to the diversity and heterogeneity of interventions, methods and outcome measures, it was deemed appropriate to report results using a narrative synthesis method. To enable meaningful analysis, results were initially explored as a whole, then in categories by intervention.

3. Results

3.1 Search results

The initial search yielded a total of 2053 papers. Duplicates were removed (510 papers), and a review of all titles and abstracts excluded a further 1475 papers deemed as not relevant. The screening of the full text of the remaining 70 papers resulted in exclusion of a further 48 papers. Figure 1 presents a PRISMA flow-diagram showing the selection process and reasons for exclusion. Two of the papers (Heppner et al 2008; Liang et al 2018) contained more than one study, but in each case only one of the studies met the inclusion criteria (Heppner et al 2008, Study 2; Liang et al 2018, Study 1).

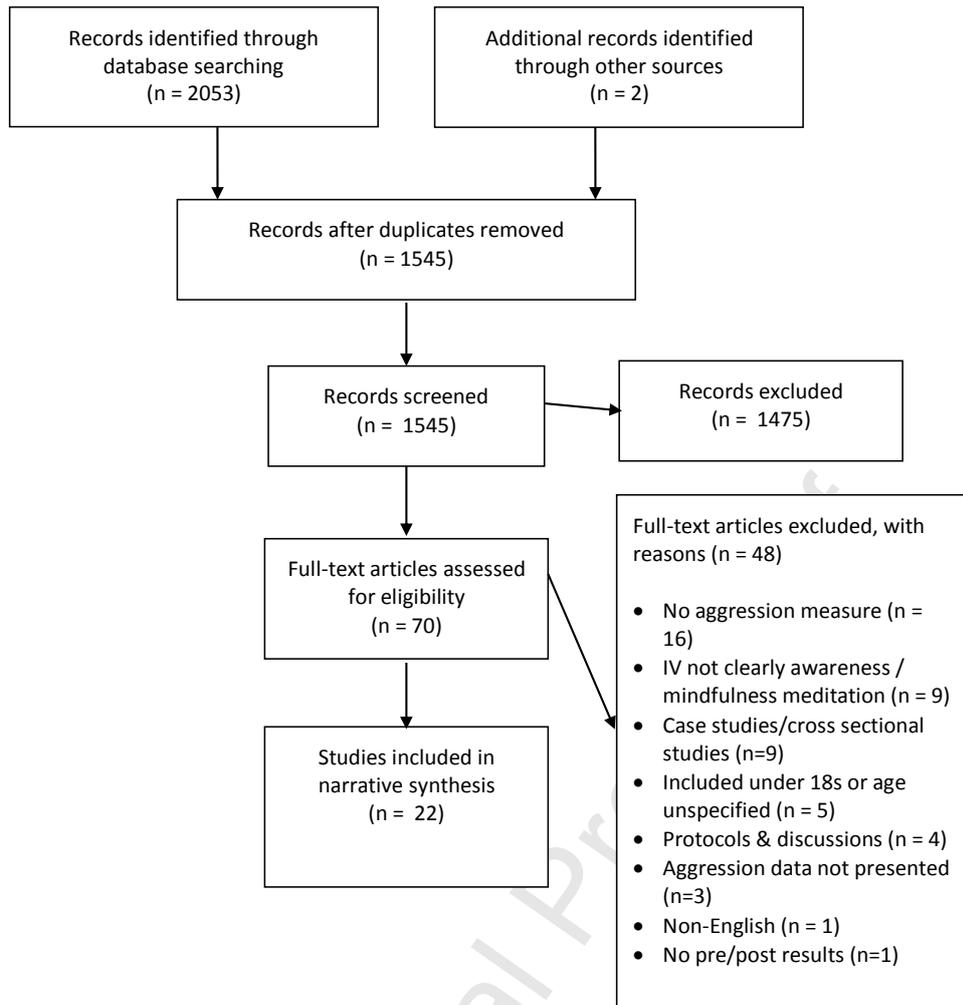


Fig. 1 PRISMA flowchart detailing the study selection process

Key details of each of the included studies (n=22) are presented in Table 1. The 4956 participants were all over the age of eighteen. Eleven studies were conducted in the USA, four in the UK, two in Canada, and one each from India, New Zealand, Iran, Singapore and Italy respectively. Most studies focused on psychiatric patients (n=7) (predominantly those with personality disorder / emotion dysregulation), mainstream non-clinical populations (n=6) (predominantly university students) or offenders (n=4). Just over half of the studies (n=12) used manualised mindfulness-based interventions. Outcomes included various objective and subjective measures of aggression and violence. Only a small proportion of the studies (n=6) included measures of mindfulness. All studies measured outcomes at the end of the intervention, while some (n=8) carried out follow-up assessments. Intervention duration varied from ten minutes (controlled studies of brief mindfulness interventions with immediate aggression measures) to four years (cohort studies).

Table 1. Study characteristics, listed by intervention type

Author & year	Study setting	Study population	Intervention and control	Study design
ACT				
Donahue et al 2017	Veteran affairs medical centre, USA	23 military veterans	ACT (no control) - 12 weekly structured 90 minute sessions facilitated by 2 qualified and supervised practitioners	Cohort study
Harvey et al 2017	Military, New Zealand	262 military personnel with drug or alcohol related difficulties	Assigned to ACT-based 5 day course (developed by the author in accordance with ACT core processes, co facilitated by a counsellor and a clinical psychologist) or waitlist control group	Controlled clinical trial
Zarling et al 2015	Community mental health settings, USA	101 adults seeking treatment for mental health, with at least two incidents of physical aggression towards partners in the previous six months	Randomly assigned to ACT (12 group sessions facilitated by trained ACT therapists) or attention placebo control (support and discussion group)	Controlled clinical trial
Zarling et al 2017	Iowa Department of Corrections, USA	3474 men who were enrolled in batterer intervention programmes following being convicted of domestic assault	Assigned to ACT (delivered through two 2-day training events) or TAU control (Duluth-CBT – 3-day training event). Facilitated by trained professionals and observed for consistency	Cohort analytic
DBT				
Brown et al 2013	Clinical justice services, USA	40 adults with intellectual disabilities and a history of severe problem behaviours	DBT Skills System (no control) – 4 years. 1 hr of individual DBT and 1 hr of (simplified) group "skills system" training per week, and behavioural treatment programmes. Treatment administered by qualified clinicians trained by Behavioral Tech LLC	Cohort study
Clarkin et al 2007	Psychiatric outpatients, USA	90 adults with a diagnosis of borderline personality disorder	Randomly assigned to DBT, psychotherapy or supportive treatment for 1 year. All therapists were qualified, monitored and supervised	Controlled clinical trial
Evershed et al 2003	Forensic patients, UK	17 males with a diagnosis of borderline personality disorder	Received 18 months of DBT (consisting of weekly group sessions and weekly individual sessions facilitated by nurses and psychologists) or treatment as usual (TAU) control group	Cohort analytic
Feigenbaum et al 2012	NHS specialist PD service, UK	42 adults with a cluster B personality disorder	Randomly assigned to DBT (2.5hrs of skills training and 1 hour individual therapy per week for a year, facilitated by qualified practitioners trained in DBT) or TAU group (individualised interventions)	RCT
Fox et al 2015	Low-secure unit, UK	18 women with a diagnosis of borderline personality disorder	DBT (no control) - 2 hour-long skills sessions and one individual DBT therapy session per week for 1 year, facilitated by DBT practitioners trained by Behavioral Tech LLC	Cohort study
Pozzi et al 2008	Psychiatric outpatients, Italy	6 adults with personality disorders	A 6 months DBT group intervention (no control), meeting every 14 days, complemented by individual psychotherapy every week for 2 years	Cohort study
Tomlinson &	Forensic psychiatric	15 forensic psychiatric patients who	Randomly assigned to DBT (Skills teaching 1.5hrs per week for 6	Controlled

Hoaken 2017	hospital, Canada	were identified as struggling with emotional dysregulation.	months, and between session coaching; no individual therapy. DBT leaders trained by Behavioral Tech LLC) or a waitlist control	clinical trial
Mindfulness				
DeSteno et al 2017	USA	77 adults with no prior meditation experience	Randomly assigned to 3 week online mindfulness (headspace) or 3 week online logic problems, then exposed to provocation	Controlled clinical trial
Dwivedi et al 2015	Workplace, India	160 employees from an engineering department	Randomly assigned to yoga (including 10 minutes Dhyana meditation per session), or physical exercise control group, 1 hr per day, 5 days per week for 10 weeks, facilitated by qualified instructors	RCT
Jenaabadi & Jahangir 2017	Addiction treatment centres, Iran	57 opioid-dependent patients.	Randomly assigned to an 8 week mindfulness course (comprising a 90 minute session per week), a methadone-maintenance group or a no-treatment group	Controlled clinical trial
Robins et al 2012	USA	56 adults	Randomly assigned to MBSR (8 weekly classes of 2.5hrs per week facilitated by experienced MBSR teachers) or to a waitlist control group	Controlled clinical trial
Tollefson & Philips 2015	Domestic violence treatment centres, USA	90 men who had been court ordered to complete a domestic violence offender treatment programme	Randomly assigned to mind-body bridging (MBB) programme (16 sessions, facilitated by social worker certified in MBB practice) or TAU control (psycho-educational treatment programme, licensed therapists)	RCT
Wupperman et al 2012	Addiction and substance abuse clinic, USA	14 women who had recently been arrested for domestic violence, met the criteria for alcohol abuse and were court mandated to a treatment programme.	12 weekly sessions of mindfulness modification therapy (MMT) (no control), provided by a doctoral level psychologist (the developer of MMT)	Cohort study
Wupperman et al 2015	Mental health clinic, USA	25 women with problematic drinking, anger problems and physical aggression	Attended mindfulness modification therapy (MMT) (20 weekly individual sessions of mindfulness modification therapy) or TAU control (multi-modal program including psychotherapy)	Cohort analytic
Brief MBIs				
Heppner et al 2008, Study 2	USA	60 undergraduate students.	Randomly assigned to mindfulness rejection group (scripted brief mindful eating activity), rejection group or acceptance group. Rejection and mindfulness rejection groups were then exposed to a rejection manipulation	Controlled clinical trial
Keng & Tan 2018	Singapore	118 graduate and under-graduate students who scored over 38 on BPD traits	Randomly assigned to receive 10 minutes mindfulness audio-guided instruction, 10 minutes Loving Kindness (LKM) audio-guided instruction, or no instruction. All participants were then exposed to a social rejection manipulation	Controlled clinical trial
Liang et al 2018, Study 1	Workplace, Canada	101 full-time employees who identified a negative interaction with their supervisor	Randomly assigned to watch and consider 6 statements on a screen in the following three groups: mindful awareness, mindful acceptance, mind-wandering (control). All participants were then exposed to a social rejection manipulation	Controlled clinical trial
Yusainy &	UK	110 British adults without a	Randomly assigned to mindfulness (15 minute audio "mindfulness of	RCT

Lawrence 2015

mindfulness practice

body and breath") intervention or control (neutral themed educational information)

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3.2 Methodology and quality assessment

Four of the studies were randomised controlled trials, ten clinical controlled trials, three cohort analytic studies, and the remaining five cohort studies (using the categorisation presented within the Quality Assessment Tool for Quantitative Studies). Seventeen of the studies had a control group. However, one of those (Clarkin et al 2007) did not present comparative data between the groups, so had to be treated as a cohort study. Quality assessment scored seven of the papers as “moderate” and the remaining studies as “weak” (see Table 2). Overall, papers generally appeared stronger in the areas of study design and data collection methods.

3.3 Synthesis of outcomes

Overall, sixteen of the twenty-two studies (72.7%) contained results suggesting that mindfulness interventions had a significant impact on levels of violence and aggression (with effect sizes ranging from 0.21 to 0.87). Details of outcome measures and results are presented in Table 2. There was considerable heterogeneity in interventions, methods and outcome measures. The results, categorised by intervention type, are further explored below.

Table 2. Participants and outcomes, listed by intervention type.

Author & year	Participant characteristics	Outcome measures	Results	Quality assessment
ACT				
Donahue et al 2017	Age 27-70 (M=54.83, SD=14.57). 100% male, 81% Caucasian	Aggression measured by Buss and Perry Aggression Questionnaire (BPAQ), mindfulness measured by acceptance and action questionnaire (AAQII)	Significant reduction in physical aggression (AQ) ($p<.05$); effect size=0.53 (post-treatment) and 0.39 (follow-up). Reductions in verbal aggression (AQ) were not statistically significant; effect size=0.21. Significant difference in AAQII ($p<.01$); effect size=0.65 (post-treatment) and 0.86 (follow-up)	Moderate
Harvey et al 2017	Age 18-50, 85% male, 41% Caucasian, 59% single	Aggression measured by Buss-Perry Aggression Questionnaire short form (BPAQ-SF)	Significant changes in verbal (effect size=0.25) and physical aggression (effect size=0.38) in intervention group compared to control ($p<.05$)	Weak
Zarling et al 2015	Age 19-67 (M=31.45, SD=7.39), 32% male, 82% Caucasian	Aggression measured by Conflict Tactics Scale 2 (CTS-2). Acceptance measured using Acceptance and Action Questionnaire-II (AAQ-II)	Participants in the ACT group had a significantly greater decline in physical (effect size=0.79, 6-month follow-up) and psychological (effect size=0.96, 6-month follow-up) aggression than the control group ($p<.001$), and significant reduction in experiential avoidance ($p<.001$)	Moderate
Zarling et al 2017	Age 18-72 (M=33.45, SD=10.25), 59.3% Caucasian, 47% employed	Aggression measured by recidivism (criminal justice data).	Significantly fewer ACT participants received any domestic assault ($p<.05$) or violent charges ($p<.001$); effect size range=0.21-0.47	Weak
DBT				
Brown et al 2013	Age 19-63 (M=30.8, SD=10.1), 85% male	Behavioural measures of observed behaviour	Significant reductions in aggression across the measurement period (4 years) ($p=.003$); effect size (red flags)=0.53	Weak
Clarkin et al 2007	Age 18-50(M=30.9, SD=7.85), 8% male, employed 59%	Anger irritability and assault questionnaire (AIAQ)	DBT resulted in significant reduction in verbal assault and direct assault ($p=.001$); effect size=0.87 and 0.56, respectively	Moderate
Evershed et al 2003	Age 21-52, 100% male, sentences 5yrs-life	Aggression measured by observed behavioural measures	Interaction effect showed significant reduction in the severity of aggression ($p=0.00$). Reduction in frequency was not significant	Weak
Feigenbaum et al 2012	Age 23-56, 27% male, employed 5%, single 84%	Aggression measured by Overt Aggression Scale (OAS)	No significant difference within or between the DBT group and the TAU group	Weak
Fox et al 2015	Age 18-45 (M=29.0, SD=9.0)	Aggression measured by Overt Aggression Scale (OAS)	Patients demonstrated a significant reduction in verbal and physical aggression ($p=.008$); effect size=0.44	Moderate
Pozzi et al 2008	Mean age 42 (SD=5.5), 25% male	Aggression measured by Buss and Perry Aggression Questionnaire (BPAQ)	No statistically significant reduction.	Weak
Tomlinson &	Age 28-63 (M=42.73,	Aggression measured by Buss-Perry	No significant difference in decrease in aggression between groups	Weak

Hoaken 2017	SD=12.12), 80% caucasian,80% male	Aggression Questionnaire short form (BPAQ-SS).		
Mindfulness				
DeSteno et al 2017	Age 18-24	Aggression measured by Taylor Competitive Reaction Time (TCRT - hot sauce)	Intervention group demonstrated significantly lower levels of aggression than control group (p=.005); effect size=0.84	Weak
Dwivedi et al 2015	Mean age 28.29 (+- 5.21), 55% male	Aggression measured by Buss and Perry Aggression Questionnaire (BPAQ)	Significant reduction in aggression in yoga and meditation group compared to control (p<.001); effect size=0.32	Weak
Jenaabadi & Jahangir 2017	Age 20-45, 50% employed	Aggression included in Symptom Checklist-90-Revised (SCL-90-R)	Significant reduction in aggression in mindfulness group compared to methadone and control groups (p=.00)	Weak
Robins et al 2012	Age 21-87 (M=46.25, SD = 12.97), 16% male, 91% Caucasian	Aggression measured by the Spielberger Anger Expression Scale (STAXI), mindfulness measured by FFMQ	The MBSR group demonstrated a significantly greater increase in mindfulness (p<.001; effect size=0.47) and a significantly greater decrease in aggression (p<.005; effect size=0.24)	Weak
Tollefson & Philips 2015	Age 19-64 (M=33.5), 100% male, 76% Caucasian	Aggression measured by recidivism, mindfulness measured by FFMQ	The MBB group showed a significant increase in mindfulness (p<.01). There was a lower, but not significant, rate of reoffending in the MBB group	Weak
Wupperman et al 2012	Age 21-64 (M=38, SD=13.44), 43% African American	Aggression measured by Timeline Follow-Back Assessment (TLFB)	Significant decreases were shown in aggression (p<.001; effect size=0.68)	Moderate
Wupperman et al 2015	Age 28-62 (M=40, SD=10), 44% black, 77% unemployed	Aggression measured by Timeline Follow-Back Assessment (TLFB) and the Conflict Tactics Scale 2 (CTS-2). Mindfulness measured by Mindful Attention Awareness Scale (MAAS)	Participants in MMT showed significantly increased mindfulness (p=.02) and significant decreases in aggression (physical – p=.01, effect size=0.51; verbal – p=.008, effect size=0.55). Physical aggression showed a significantly greater decrease in the MMT group than the TAU group (p=.02). The interaction effect for verbal aggression was not significant	Moderate
Brief MBIs				
Heppner et al 2008	53% male. Age and other demographics not presented	Aggression measured by intensity of aversive stimulus (TCRT – white noise)	Reduction in aggression in mindfulness group compared to control failed to reach statistical significance	Weak
Keng & Tan 2018	Mean age 21.71, (SD=2.70), 36% male, 77% Chinese	Aggression measured by intensity of aversive stimulus (TCRT - white noise)	Mindfulness group demonstrated lower levels of aggression but failed to reach significance	Moderate
Liang et al 2018	Mean age 37 (SD=10.67), 48% male	Aggression measured by voodoo doll test (VDT)	Participants in mindful awareness condition demonstrated significantly less aggression than the control group (p<.05); effect size=0.25. Reduction in aggression in the mindful acceptance condition, whilst more than the control, was not significant; effect size=0.19	Weak

Yusainy & Lawrence 2015	Age 18-31 (M=19.52, SD=2.03), 47% male	Aggression measured by Adapted Taylor Competitive Reaction Time (TCRT – white noise), mindfulness measured by the Toronto Mindfulness Scale (TMS)	The link between depletion and aggression was moderated by mindfulness under low / medium levels of provocation ($p=.04$), but diminished under high provocation. The mindfulness group showed significantly higher levels of decentering than the control group ($p=.01$) but not of curiosity	Weak
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3.4 Acceptance and Commitment Therapy (ACT)

Four papers focused on ACT (Donahue et al 2017; Harvey et al 2017; Zarling et al 2015; Zarling et al 2017) – a mindfulness-based intervention with the addition of a focus on value-based action. Sample sizes ranged from $n=23$ to $n=3474$, and timescales from one week to twenty-four weeks. Two studies focused on the military, one on domestic violence offenders and one on community mental health settings with a focus on violence towards a partner. All four papers showed a decrease in aggression. The three comparative studies demonstrated statistically significant reductions in aggression for the ACT as compared to the control group across different aspects of aggression. With a smaller sample and a cohort design, Donahue et al (2017) reported reductions in both verbal and physical aggression, but the reduction in verbal aggression did not reach statistical significance. Interventions which took place over a number of weeks (Donahue et al 2017 and Zarling et al 2015) showed higher effect sizes (0.53 and 0.79 respectively) than those taking place over days (0.38 and 0.21). Generally the quality was slightly better than the DBT studies, with greater transparency of method and more detailed reporting of data.

Two studies used the BPAQ as the aggression measure, one used the Conflict Tactics Scale-2 (CTS-2) (Straus et al 1996) and the fourth used a behavioural measure (recidivism). Two of these studies measured mindfulness with the Acceptance and Action Questionnaire-II (AAQ-II) (Bond et al 2011), which measures experiential avoidance and psychological flexibility. Both showed statistically significant decreases in avoidance.

3.5 Dialectical Behaviour Therapy (DBT)

Seven of the twenty-two papers (Brown et al 2013; Clarkin et al 2007; Evershed et al 2003; Feigenbaum et al 2012; Fox et al 2015; Pozzi et al 2008; Tomlinson & Hoaken 2017) used DBT as the intervention. DBT includes elements of mindfulness within the skill set, but mindfulness practice is not compulsory for participants. Sample sizes in these studies varied from $n=6$ to $n=90$, and timescales from six months to four years. Results were particularly variable in this group. Implementation also varied (with many interventions being adapted for context), as did the training and qualifications of facilitators. Samples were often pragmatic, as randomisation can be complex due to ethical concerns in settings with vulnerable adults (all of the DBT studies were within clinical populations). Three of the studies had no comparator, and a fourth also had to be treated as a cohort study as it did not present data on the differences between the intervention and control group (Clarkin et al 2007).

Data and methodology were variable. Two of the studies used behavioural measures of aggression (incident data recorded by staff in clinical settings), two used the Overt Aggression Scale (OAS) (Yudofsky et al 1986), two used the Buss and Perry Aggression Questionnaire (BPAQ) (Buss & Perry 1992) and one used the Anger Irritability and Assault Questionnaire (AIAQ) (Coccaro et al 1991). The data presented in Brown et al (2013) did not establish baseline measures or clear results, and emails to the author failed to elicit a response.

Tomlinson & Hoaken (2017) used the BPAQ as the aggression measure, but instead of reporting the results of the BPAQ, presented a table showing “improvement, no change, or deterioration”, making results difficult to interpret. In Evershed et al (2003) the groups weren’t equivalent, there was no adherence training for therapists, treatment as usual (TAU) was varied, and the DBT group had access to TAU. In Brown et al (2013) and Fox et al (2015), behavioural measures were reported by nursing or care staff, which may have led to variance and inconsistencies in reporting. None of the studies on DBT reported mindfulness measures.

Of the four cohort studies, three suggested that there was a decrease in aggression following DBT. Of the three studies with comparators, two reported no significant difference for either group, and a third reported a significant decrease in the severity (but not frequency) of violence for the DBT group (Evershed et al 2003). Effect size was only available for three of the papers, and ranged from 0.44 to 0.87. There was no obvious correlation between length of programme and significance of outcome.

3.6 Mindfulness

Seven papers focused on interventions which were either mindfulness or had a strong element of mindfulness within them. Sample size ranged from n=14 to n=160, and the timescales from three weeks to twenty weeks. All except one study included a comparator. Six out of the seven studies demonstrated a statistically significant impact on aggression, although Wupperman et al (2015) reported data reaching significance for physical but not verbal aggression. Effect sizes, where available, ranged from 0.24 to 0.84. Three interventions were mindfulness programmes (DeSteno et al 2017; Jenaabadi & Jahangir 2017; Robins et al 2012). Two studies used Mindfulness Modification Therapy (MMT), which was designed for behavioural dysregulation, and centres around mindfulness with the addition of an explicit focus on behaviour change (Wupperman et al 2012 & 2015). One paper focused on yoga, and was included as it incorporated Dhyana meditation which is an awareness practice. (Dwivedi et al 2015). The control group received a physical exercise regime, resulting in a difference between the physical exercise group and the yoga group, but it is not possible to identify whether the change in aggression was attributable to Dhyana or other aspects of yoga. One study used Mind-Body Bridging, a

programme for offenders with elements of mindfulness and a strong focus on developing understanding of the “*identity system*” which can lead to “*explosive states*” (aggression) (Tollefson & Phillips 2015, p786). This was the only study in this intervention group where the reduction in aggression failed to reach statistical significance. As with ACT, studies were generally better structured than those focused on DBT, although still scoring low on the quality assessment.

Aggression measures were varied, including five validated measures and one behavioural measure (recidivism). Only three of the studies measured mindfulness, two using the Five Facet Mindfulness Questionnaire (Baer et al 2006) and one using the Mindful Attention Awareness Scale (Brown & Ryan 2003). All three showed statistically significant increases in mindfulness.

3.7 Brief MBIs

Four papers (Heppner et al 2008; Keng & Tan 2018; Liang et al 2018; Yusainy & Lawrence 2015) used very brief mindfulness interventions (5-15 minutes), designed to induce a more mindful state in a short time. These were more experimental studies in laboratory conditions and used observable measures of aggressive behaviour. Three of these were based around Taylor Competitive Reaction Time (TCRT) (Taylor 1967), and the fourth used a Voodoo Doll Task (VDT) (McCarthy et al 2016). Sample sizes varied from n=60 to n=118. All four studies found a decrease in aggression in mindfulness intervention groups, but the decrease only reached statistical significance in two of the four papers. One of these (Liang et al 2018) identified that the mindful awareness intervention produced a bigger effect size in comparison with the control than mindful acceptance intervention. These were all controlled trials with more manageable conditions than clinical trials, minimising confounding variables. Only one of the studies (Yusainy & Lawrence 2015) measured mindfulness, and found a statistically significant increase, though the increase was significant in the “*decentering*” aspect of mindfulness on the Toronto Mindfulness Scale (TMS) (Lau et al 2006) and not the “*curiosity*” aspect.

4. Discussion

4.1 Main findings

The studies identified in this review suggest a trend in favour of mindfulness interventions impacting on levels of violence and aggression. However, these results need to be interpreted with caution due to the high risk of bias in the majority of the studies and the heterogeneity of the samples, interventions and measures. It is

possible to learn from these results, and the ensuing paragraphs aim to extrapolate points of interest and relevance through discussion of findings in relation to the different mindfulness-based interventions.

4.2 DBT

In practice, DBT is complex to deliver and fidelity of implementation can vary (Bloom et al 2012), and certainly that is the case in the studies reviewed here. Timescales and modes of implementation differed significantly between papers, and DBT had been adapted to the needs of different groups. Fox et al (2015) suggest that reductions in aggressive behaviour lag behind changes in the clinical symptoms of personality disorder. As all of the studies using DBT took place with clinical populations, mental health status is an important variable in considering the results.

While Frazier and Vela's critical review (2014) found DBT to show promise in reducing aggression and violence, it still concluded that there was limited evidence to support DBT being any more effective than treatment as usual. In addition, the critical review had taken some conclusions at face value; for example, one included study (Pozzi et al 2008) claimed a significant reduction in aggression, which this current systematic review has found not to be supported by the data presented. Two of the DBT studies (Brown et al 2003; Evershed et al 2003) used incident reports of aggression from healthcare practitioners (nurses and care staff), which sometimes involved individualised measures for each participant (such as including behaviours which may not be deemed as aggressive in general but signified a risk for that individual), making replication and generalisation of results difficult.

DBT was developed primarily for working with people who were categorised as high risk for self-harm and suicide. A meta-analysis has demonstrated the effectiveness of DBT for symptoms of borderline personality disorder when compared with control interventions (Cristea et al 2017). While Linehan seems optimistic that the framework can be modified in multiple ways to address wider issues of emotion dysregulation (Linehan 2000), recent work explores the role of medication as an adjunct to DBT for aggression, which may suggest that DBT alone has limited impact in this regard (Linehan et al 2008). Mindfulness is a critical component of DBT (Chapman 2006), but mindfulness practice is not compulsory for participants, and it can be difficult to disentangle the cognitive-behavioural aspect of DBT from the mindfulness component.

4.3 Mindfulness and aggression

All the other approaches included in this review had more conclusive results, demonstrating a link between increased mindfulness and decreased aggression. Excluding the DBT studies discussed above, 12 out of the 15 remaining studies (80%) reported statistically significant results. Included papers demonstrated not only a decrease in aggression in mindfulness intervention groups, but statistical significance in comparison to controls, though this needs to be viewed with some caution due to the variable quality of the studies and the heterogeneity of interventions and methods.

Keng & Tan (2018) found no significant effect with a brief mindfulness intervention, but commented on the high levels of pre-intervention trait mindfulness across the groups, questioning whether trait mindfulness may prove a stronger effect than a brief intervention. This may potentially suggest that ten minutes is not long enough - particularly if a space then occurs between the intervention and the assessment of aggression levels - for any change to be maintained.

Despite this, two brief mindfulness studies demonstrated significant results, and contained additional points of interest. The finding of Liang et al (2018) that mindful *awareness* achieved statistical significance beyond that of mindful *acceptance* is in line with other findings; it has been noted that increased emotion dysregulation is associated with thought avoidance (Prakash et al 2015), which could imply that increased awareness of thoughts would enhance emotion regulation, impacting on aggression. In addition, it links with the recognition that self-awareness impacts on aggression (Scheier et al 1974). This is supported by the second of these two studies, in which Yusainy & Lawrence (2015) identified a moderating effect of mindfulness on the link between depletion and aggression, depletion being the phenomenon by which the ability to refrain from acting on aggressive impulses is known to “deplete” after having had to use it (so the likelihood of aggression would increase if someone has already had to control their response).

These studies of brief mindfulness interventions had one other distinguishing feature, in that they used methods of provocation to induce aggression, allowing them to gather observable, behavioural measures of aggression (TCRT). Such experimental laboratory-based methods of measuring response to provocation can be difficult to replicate in more general settings. However, one of the mindfulness studies in which participants had practised mindfulness daily for 3 weeks (DeSteno et al 2017) also used a version of TCRT as an aggression measure post intervention. This study reported a significant difference between the mindfulness and control groups ($p < .005$) with an effect size of 0.81. DeSteno et al (2017) suggest that mindfulness impacts on aggression by working on the impulse to aggress as opposed to the desire to harm (endorsed by Liang et al 2018 and Yusainy & Lawrence 2015), supporting the suggestion that emotion regulation and self-control are involved in this process.

4.4 Mechanisms of aggression

Exploration of the mechanisms of aggression is important in understanding the relationship between mindfulness and aggression. Wupperman et al (2012) note that a common feature of behavioural dysregulation is the attempt to regulate or avoid difficult emotions. Aggressive behaviour, in that context, would provide short term relief, meaning that the behaviour was negatively reinforced. This is congruent with behavioural theory, identifying how behaviours are learnt, developed and maintained (Hastings et al 2013). The relevance of mindfulness then becomes apparent, as mindfulness habituates us to difficult emotions, enabling us to observe impulses and make choices, thereby contributing to emotion regulation and enhancing neural pathways (Wupperman et al 2012).

These suggestions are corroborated by research into the neuroscientific processes of mindfulness. Distinctions have been drawn between top-down (cognitive processes in the engagement of attention and control to engage with experience) and bottom-up (experiential processes by which the person remains aware of the raw experience) systems of emotion regulation (Grecucci et al 2015; Guendelman et al 2017). Explaining the neurobiology of aggression, Siever (2008) draws attention to an *imbalance* between top-down systems (whereby the prefrontal cortex modulates aggression) and bottom-up drives from the limbic region (specifically the amygdala and insula). Mindfulness has been shown to enhance the connectivity between the prefrontal cortex and the limbic system (Bremner et al 2017).

Attention is also drawn to the range of tools used in measuring aggression. While most of the tools used in these studies have been assessed as valid and reliable measures, not all studies clearly presented their rationale for the tool they had chosen, and the tools measure different things. Fix & Fix (2013) comment on research into mindfulness and aggression having been over-reliant on self-assessment tools, suggesting that behavioural measures of aggression add validity to studies. Behavioural measures however, while they have a strength in being able to measure observable behaviour, also carry complexities in the consistency of reporting, and can be difficult to collate.

It should be noted that this review does not attempt to separate out definitions of aggression and violence, nor does it differentiate between state and trait or reactive and instrumental aggression. While aggression can be viewed as functional and part of the natural order (Koolhaas et al 2013), it is assumed in this review that the studies included were looking at problematic aggression and violence. This review only looks at violence to other, not to self, as it is recognised that the relationships and processes involved could be different.

4.5 Mechanisms of mindfulness

The aspects of mindfulness which are active in this process have not been determined through this review, partly because of the relatively small number of studies which measured mindfulness. Results in those reporting mindfulness measures show some areas of interest. Using the Toronto Mindfulness Scale (Lau et al 2006) Yusainy & Lawrence (2015) reported an increase in decentering, but not in curiosity, and a decrease in aggression – potentially indicating that decentering is more relevant to aggression. Wupperman et al (2015) used the Mindful Attention Awareness scale (Brown & Ryan 2003), and while significance is shown (in both increase of mindfulness and decrease of aggression), results of component parts are not presented, making it impossible to draw conclusions. The AAQ-II (Bond et al 2011), used by Donahue et al (2017) and Zarling et al (2015) was designed to measure experiential avoidance (also indicating psychological inflexibility), and simply measures a single aspect.

Two studies used the five facet mindfulness questionnaire (FFMQ) (Baer et al 2006), and both contain some interesting points. Robins et al (2012), whilst reporting an increase in all five facets of mindfulness and a decrease in aggression, found no correlation between the FFMQ and the Spielberger Anger Expression Scale (Spielberger et al 1985). This raises questions about whether or not the FFMQ measures the aspects of mindfulness which impact on aggression. Tollefson & Phillips (2015) whose results showed a significant increase in mindfulness overall, found that it was only the facets of ‘observing’ and ‘non-reactivity’ which scored significantly (describing, acting with awareness and non-judging all showed increases which failed to reach significance, with the increase in non-judging being particularly small). That study demonstrated a decrease in aggression which was non-significant. These results raise questions as to which aspects of mindfulness effect the aggression outcome measures.

Both Tollefson & Phillips (2015) and Zarling et al (2017) measured the use of mindfulness-based interventions (MBB and ACT respectively) with domestic violence offenders. The Zarling study showed a significant reduction in recidivism, the Tollefson and Phillips study did not, leading to a tentative suggestion that ACT may be more effective than MBB. It should also be noted, however, that the studies of ACT tended to have lower attrition rates (60-63%), and while intention to treat analysis in some cases guards against this confounding the results, attrition is an issue particularly amongst domestic violence offenders (Jewell & Wormith 2010).

4.6 Unknown factors

None of the studies included in this review explored the roles of empathy and connectivity with others in relation to aggression; thus, while mindfulness may well have impacted on those factors, it has not been possible to draw any conclusion as to this aspect of the process.

4.7 Limitations

The breadth of this review in targeting studies of the whole adult population has inevitably resulted in heterogeneity of results. While this is helpful in creating a broader overview of the impact of mindfulness on aggression, it also limits the number of conclusions which can be drawn from the results. The initial screening was mainly conducted by one person which may have left the process open to researcher bias, although the cross checking with a second researcher will have helped to limit this. In addition, the strength of this review could have been enhanced by further follow-up of references from relevant systematic reviews. While there is as yet no definitive evidence to support the value of hand-searching (Horsley et al 2011), not doing so may have led to some relevant studies being overlooked.

In addition, it should be noted that none of the studies differentiated between reactive (defense of self or others) and instrumental (driven by reward or appetite for violence) aggression.

4.8 Areas for further research

Four areas for further research have been identified. First, as the results around the use of DBT in relation to aggression were so inconclusive, this area would benefit from further good quality research. In so doing, existing studies should be scrutinised to identify which areas have not proved effective, leading to agreement on the necessary adaptations required to the standard DBT programme for aggression.

Second, the input of brief mindfulness interventions using behavioural measures of aggression has made a useful contribution to recent research. It would be beneficial to review what has been learnt from the use of TCRT-type aggression measures and explore the translation to longer mindfulness interventions in the field.

Third, further work on identifying the aspects and processes of mindfulness at work in the reduction of aggression is still needed. It is suggested that, rather than explore the multitude of different mindfulness-based interventions, studies should start with mindfulness itself, identifying the interaction of the mechanisms of mindfulness and aggression, before considering modifications. Within this, correlations between aggression measures and mindfulness measures should be examined. This would help to give greater indication as to which aspects of mindfulness are at play in contributing to reductions in aggression.

Finally, a significant contribution could be made by researching the impact of mindfulness on different aspects (reactive, instrumental and appetitive) aggression – differentiating in this way could shed light on the particular situations where mindfulness may lead to reductions in aggression, leading to advances in approaches.

5. Conclusion

Overall, the results of the present review suggest that mindfulness and mindfulness-based interventions (with the possible exception of DBT) may prove effective in reducing aggression and violence levels. Further good-quality trials are needed to establish this connection, to contrast the effectiveness of mindfulness with that of other aggression-management strategies, and to explore the aspects of mindfulness that are active in this process.

As established from the outset, it is crucial that we also remain aware of the psycho-social and environmental risk factors for aggression, and that research continues to explore the socio-political context to minimise the likelihood of violence and aggression. Approaches to address aggressive tendencies in individuals are never going to generate a comprehensive understanding or lead to robust and sustainable violence-reduction strategies.

Compliance with ethical standards

This article does not contain any studies with human participants performed by any of the authors.

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Journal Pre-proof

Highlights

- This systematic review compiles all current evidence on the effectiveness of mindfulness-based interventions to decrease the levels of aggression and violence in adults
- A detailed critique of the included studies is presented with the results categorised by type of mindfulness-based intervention
- We observed heterogeneity in population, study design, intervention, methods and outcome measures used in the included studies
- The results in 16 of the 22 included studies suggest that mindfulness had an impact on violence and aggression, with effect sizes ranging from 0.21 to 0.87

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