

Title: A pragmatic study of the impact of a brief mindfulness intervention on prisoners and staff in a Category B prison and men subject to community-based probation supervision

Running head: Mindfulness in prison and probation

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Acknowledgements: The authors would like to thank Gemma Worgan, Chantelle Gaylor, Matthew Morgan and Katherine Greenfield for their assistance with this study and Vishvaparni Blomfield who led the mindfulness groups across the studies.

Key words: mindfulness, stress, criminal justice, heart rate variability, self-regulation

Funding: this research was funded through a grant from HMPPS-Wales.

Compliance with ethical standards: The authors confirm there are no conflicts of interest to declare. The research was approved and appropriately registered for ethics / governance as detailed in the manuscript and that informed consent was obtained from all participants (again detailed in the manuscript).

Prisons are recognised as stressful environments in which to live and work. Prison populations have been shown to have a greater risk of mental health issues and stress when compared to the general population (e.g. Mansoor, Perwez, Swamy & Ramaseshan, 2015), and the prison environment itself has been shown to lead to increased levels of stress (Samuelson et al., 2007; Yi, Turney and Wildeman, 2017). Amongst prison staff, some studies suggest that 75% of prison officers present with symptoms synonymous with a psychiatric diagnosis (Kinman, Clements & Hart, 2017). A wide array of potential factors have been identified which can lead to employee turnover (Armstrong, Atkin-Plunk & Wells, 2015), absenteeism and burnout (Schaufeli, Bakker & Van Rhenen, 2009; Kinman et al., 2017), job dissatisfaction (Schaufeli et al, 2009); poor life satisfaction (Lambert, Barton-Bellessa & Hogan, 2015); risks to social and family life such as divorce (Armstrong et al., 2015) and drug and alcohol abuse (Steiner & Wooldredge, 2015). However, research with prison employees suggests that the individual's commitment to the prison organisation and factors in the prison environment (rather than an individual's disposition or personality) may be more influential on burnout (Lambert et al., 2012; Lambert, Kelley and Hogan, 2013). Similar findings have emerged from studies of community-based probation supervision where factors such as 'job meaningfulness' and 'on-the-job stress' have also been linked to job satisfaction (Getahun, Sims & Hummer, 2008). For those subject to probation, studies have drawn attention to the 'pains' encountered by ex-prisoners subject to mandatory probation supervision (Durnescu 2011; Schinkel 2017). These 'pains', such as financial difficulties, reintegration challenges and anxiety about possible recall to prison can provoke stress-driven psychological problems (see also, Hayes 2015).

Mindfulness, stress, coping, and anger

Mindfulness is a process in which attention is regulated, awareness is focused on one's moment-to-moment experience and an open and accepting attitude is adopted towards experience

(Bishop et al., 2004; Creswell, 2017; Kabat-Zinn, 2013). This is achieved through a number of techniques which encourage self-observation without emotional reaction or judgement (Roeser et al., 2013). The use of mindfulness practice has become increasingly popular within the general population and has been used as the foundation of a number of treatment interventions especially in relation to those experiencing stress (e.g. Mindfulness-Based Stress Reduction (MBSR); Kabat-Zinn et al, 1992) and depression (e.g. Mindfulness-Based Cognitive Therapy; Segal, Williams & Teasdale, 2018).

Research suggests that individuals who are 'more mindful' appraise situations as less stressful and are more likely to apply adaptive coping strategies (Weinstein, Brown & Ryan, 2009). Indeed, Martin-Asuero and Garcia-Banda (2010) found that following mindfulness training, 75% of participants reported their lives to be less stressful and indicated improvements in their ability to cope with stress, while mindfulness training has also been associated with improvements in burnout with nurses (Cohen-Katz et al., 2005) and teachers (Roeser et al., 2013). Theoretical claims that mindfulness could assist in regulating anger and provocation (e.g. Howells, Tennant and Elmer, 2010) have received some support from empirical research. For example, a large-scale study conducted across six Massachusetts prisons found a significant impact of mindfulness on hostility (Samuelson et al., 2007) while Suarez et al. (2014) found that mindfulness training encouraged inmates to express their feelings, take responsibility and communicate their needs without anger. Alongside this, Sumter, Monk-Turner and Turner (2009) found improvements in guilt and hopelessness feelings, as well as reduced sleeping difficulties, stress and anxiety. A large study of 1350 inmates who had committed drug offences, showed that MBSR resulted in reductions in hostility, and mood disturbance and improvements in self-esteem (Samuelson et al, 2007).

In addition, programmes with embedded meditation elements such as mindfulness and yoga (Barrett 2017) have also been shown to reduce stress and dysfunctional anger amongst people subject to probation supervision in the community. Henwood, Browne and Chou (2018)

found reductions in levels of self-reported dysfunctional anger by participants in a treatment programme that included relaxation and visualisation. Amongst prisoners, individuals engaging in a transcendental meditation (TM) program reported significant reductions in measures of trauma, dissociation, depression, anxiety, sleep disturbance and perceived stress compared to a control group (Nidich et al., 2016) whilst those participating in yoga have been shown to report lower stress and increased cognitive control (Bilderbeck et al, 2013). Although critical of methodological weaknesses within current research, a systematic review of 'Buddhist-derived Interventions' in correctional settings found a number of areas of improvement including relaxation capacity and self esteem (Shonon et al, 2013).

Limitations with the existing criminal justice based evidence

Whilst the emerging evidence appears encouraging, there are several limitations with the existing research. Common issues are that mindfulness has been delivered as an adjunctive intervention alongside other meditative interventions such as yoga (Auty et al. 2017; Auty, in press); have been delivered to specific groups (e.g. those who have committed drug offences) or have been linked to incentives such as early release through participation (Samuelson et a, 2007). No published research has focused on prison staff, and most existing studies have relied solely on self-report assessments to determine impact. With regard to stress self regulation (a common outcome variable in mindfulness research), physiological measurement through heart rate variability (HRV) and computer based assessment of cognitive control could provide important additional indicies. HRV refers to the degree of beat-to-beat fluctuation in heart rate and is considered to be a psychophysiological marker of stress (Shearer, Hunt, Chowdhury and Nicol, 2016) and of self regulation (Reynard, Gevirtz, Berlow, Brown, & Boutelle; 2011) with resting HRV having been used in some areas of research (Young & Benton, 2018). Higher variability is associated with less emotional arousal and greater stress adaptation (Cornet, de Kogel, Nijman, Raine and van der Laan, 2014). Studies have shown that within general

population samples, engaging in ‘mindful breathing’ can increase HRV (Burg, Worf and Michalak, 2012), as can a four-week mindfulness intervention (Shearer, et al., 2016). In relation to cognitive control, behavioral measures gathered via computer based tasks have also been shown to be sensitive to change following mindfulness interventions in research examining ‘emotional eating’ (Lattimore, 2019). Thus supplementing self report with physiological (HRV) and computer based reaction time / accuracy assessment would enhance the robustness of the measurement available.

Given the growing interest in mindfulness based interventions within correctional settings, it is essential to address the lack of research with prison staff, prisoners and those subject to community criminal justice supervision based on multiple data sources.

Aims

This paper presents two related studies which were conducted within one geographic region of the UK. Study 1 aimed to investigate the outcomes on staff and prisoners of a brief mindfulness training intervention conducted in a single Category B UK prison. Study 2 aimed to examine the impact of mindfulness on individuals serving a community sentence under the supervision of a probation service in the UK, either instead of or subsequent to a period in prison. The two studies were conducted concurrently with the prison study led by the first author and the probation (community) study led by the second author. The research team were completely independent of the recruitment to, and delivery of the mindfulness programme.

STUDY 1

Hypotheses

Following a mindfulness intervention, it is expected that a) mindfulness, b) cognitive control and c) resting heart rate variability will increase and c) self reported stress will decrease between

baseline and follow up. Further, it is anticipated that d) mental health, e) burnout (staff groups) and f) provocation (prisoner cohort) will remain broadly unchanged eventhough some studies have indicated changes in these areas. While these areas are relevant targets for mindfulness, these are included as control variables as it is expected that the brevity of the intervention and the multiple determinants on these factors (including context and environment) would lead to little self reported change within the timeframe assessed. These additional measures therefore enable testing of any simple post intervention generalised satisfaction / improvement effects and response bias indictaed by gains across all measures.

Methods

Study design.

A phased intervention design was employed with participants recruited to take part in one of five mindfulness groups at various time periods over the course of 10 months. Based on levels of participant interest, three groups were delivered to prisoners and two groups to staff. Staff and prisoner comparison groups provided baseline data to enable the representativeness of the mindfulness group to the wider groups to be gauged.

Ethics and governance considerations.

For ethics purposes, this study was deemed a service development evaluation (no randomisation; individual choice re intervention) and received University ethical review and was registered with the HMPPS National Research Committee (Ref: 2017-092). Unique identifiers (created by participants) were used to anonymously match data across time points. All participants were given information about the study and completed a consent form prior to participating.

Procedure.

Those facilitating the intervention recruited individuals to the mindfulness programme; prisoners were invited from a rehabilitation unit (cohorts 1 & 2) and a specialist violence reduction unit (cohort 3) with an open invitation to staff from across the prison. For prisoners, the mindfulness groups were neither mandatory nor a part of any sentence plans. Individuals who opted into the programme were provided with information about the study although there was no requirement for those attending the mindfulness group to participate in the formal study.

Participants were asked to provide data in the 4 weeks before the mindfulness programme and within 4 weeks of the programme ending. Data were collected by researchers visiting the prison site. Participants completed a questionnaire booklet, a computerised task and wore a heart rate monitor for 5 minutes while resting. Data collection processes took approximately 30 mins per participant and took place in meeting rooms within the psychological interventions unit of the prison (prisoner groups 1 & 2; staff groups) or a quiet room on the prison wing (prisoner group 3; for operational/ safety reasons).

Materials.

A copy of the staff and prisoner questionnaire booklets are available from the first author.

Demographic information comprised basic data: age; sentence length & index offence (prisoner cohort); gender; length of employment in prison service & job role (staff cohort). In selecting measures for use, their availability, brevity, use in prison settings or in other mindfulness research and ease of use were considered. Due to resource constraints the materials were not piloted with any of the specific participant groups in this study.

Mindfulness.

Self-reported dispositional mindfulness was assessed using two widely cited tools; the *Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2008)*, and the *Cognitive and Affective Mindfulness Scale Revised (CAMS-R; Feldman et al., 2007)*. The FFMQ uses 39-items to assess five mindfulness traits thought to demonstrate a tendency to be mindful in daily life: observing, describing, acting with awareness, non-reactivity to inner experience, and non-judging of inner experience. Items are rated on a five-point scale. The authors report acceptable reliability ($\alpha = .72 - .92$) and construct validity (e.g. concurrent validation) for the scales. The CAMS-R is a brief 12 item measure of mindfulness with items rated on a four-point scale. The authors report acceptable internal consistency ($\alpha = .74 - .77$) and convergent and discriminant concurrent validity.

Stress.

Self-reported stress was measured using the *Perceived Stress Scale (PSS; Cohen, Kamarck and Mermelstein, 1983)*; a 10-item measure which assesses the extent to which an individual appraises their life as stressful. The PSS focuses on thoughts and feelings experienced during the last month, recorded using a five-point scale. The authors report good internal consistency ($\alpha = .84 - .86$) and good test-retest reliability (2 day interval $\alpha = .85$).

Provocation.

Provocation was assessed in the prisoner cohort only using the *Provocation Inventory (PI; Novaco, 2003)*. Respondents provide ratings to statements which show different types of situation which might induce anger, on a four-point scale. The reported internal consistency for the scale is high ($\alpha = .94$)

Burnout.

Staff burnout was assessed with the *Oldenburg Burnout Inventory (OLBI; Demerouti and Bakker, 2008)*. This 16-item questionnaire is designed to measure work based exhaustion and disengagement. The OLBI assesses respondents' general view and is rated on a four-point scale. The authors report internal consistency of .85 for both scales.

Mental health screening.

Staff completed the *Patient Health Questionnaire – 4 (PHQ-4; Kroenke et al., 2009)*, a four-item screening measure designed to provide a very brief index of anxiety and depression. The PHQ asks respondents to rate problems over the previous 2 weeks on a 4 point scale. The authors report good construct validity for the sub-scales.

Cognitive control.

Impulse control was assessed in both the prisoner and staff groups using the Stop Signal Task ('Stop-It'; Verbruggen et al, 2008). Participants are required to respond as quickly and as accurately as they can to a shape that acts as a stimulus. When the individual sees a square they are required to press the "Z" key; when they see a circle they are to press the "/" key as quickly as they can. However, if they hear a sound after the shape (which occurs 25% of the time at random) they are required to press no key and wait for the next shape to appear. The index known as SSRT has been used to indicate impulsivity (a lack of cognitive control) in prisoners (Bell & Polaschek, 2017). This index has also been used when assessing the impact of mindfulness in general population cohorts (Lattimore, 2019).

Physiological measurement.

Physiological indicators of stress and self regulation based on heart rate data were collected from staff and prisoners with *Firstbeat Bodyguard 2* heart rate monitors. Participants wore the

device for five minutes while resting. This device is noted for its accuracy in measuring HRV across a range of conditions (Luque-Casado, Zabala, Morales, Mateo-March and Sanabria, 2013). Three indices (SDNN, CMSDD and RR interval) were extracted and data were analysed using Kubios HRV Analysis Software 2.0 (The Biomedical Signal and Medical Imaging Analysis Group, Department of Applied Physics, University of Kuopio, Finland).

Participants

Of the 85 people recruited into the study (53 prisoners, 32 staff); 69 individuals (44 residents and 25 staff) were scheduled to attend one of the mindfulness programmes. Three staff attended one of the mindfulness groups but did not participate in data collection. As can be seen in table 1, the cohorts attended at different times of year over a 10 month period. The comparison group provided data at a single time point and were comprised of individuals who had no intention of participating in a mindfulness programme. This was a requirement of the approvals given for the study.

Of the prisoner group who provided data at baseline, five did not start a mindfulness group giving practical reasons (e.g. timetable clashes, transferred to another prison) for this. Over half of those who started a programme completed it (21 prisoners = 55%; 15 staff = 60%); of these, all the staff and the vast majority (17; 81%) of the prisoners were available to provide follow up data. Staff reasons for drop out included a lack of time and not getting along with the content or the group facilitation. Some prisoners reported dropping out because they felt the prison wasn't set up to support mindfulness practice (e.g. noise; lack of personal space). Prisoner cohort 3 had the highest drop out rate which is consistent with this groups' wider difficulties with maintaining engagement with prison rules and programmes.

Insert table 1 about here

The majority of the prisoner group was under 35 (62%) with an average of 3 prison sentences including the current one (table 2). The intervention group had spent more time in prison on their current sentence and had been sentenced to a longer time period. Proportionally more prisoners from the 36-45 age group were lost to follow up, while those completing follow up assessments tended to have longer sentences and had spent longer in prison.

Insert table 2 about here

The staff group (table 3) were drawn from a number of different job roles including interventions staff and teachers. There were more women than men both in the intervention and comparison groups. The modal age was 36-45 for the intervention group and 26-35 for the comparison, although there was no significant difference in ‘time in the service’ across the two groups.

Insert table 3 about here

Intervention

The programmes ('Breathe Free' for the prisoner group and 'Mindfulness in the Workplace' for staff) ran over eight two hour sessions and were led by an experienced mindfulness trainer and practitioner (member of the British Association for Mindfulness Based Approaches). Content included psychoeducation, group sharing of experiences and practical exercises and sessions were supplemented by a workbook and between-session practice. The *Breathe Free* programme is an adaptation of the 12 session *Path of Freedom* programme (Crisp and Maull 2007) and incorporates aspects of Mindfulness-Based Cognitive Therapy (Williams, Teasdale, Segal & Kabat-Zinn 2007) and Compassion Focused Therapy (Gilbert 2010). The focus is upon self-awareness and self-management with each session having specific learning objectives and a structure to achieve this.

Approach to analysis

Statistical analyses were performed using IBM SPSS version 22. Baseline comparisons of outcome measures by group were assessed using univariate analysis of variance with baseline correlations assessed between the mindfulness measures, mindfulness measures and perceived stress, and perceived stress and mental health. Hypotheses were examined using repeated measures analysis of variance.

Results

Group (prisoner; staff) and cohort effects.

Participant baseline scores for each of the measures are presented in table 4. No significant differences were found between staff and prisoners for mindfulness however, staff scored significantly lower than prisoners for perceived stress ($F_{1,67} = 5.04, p=.028$). No statistically significant differences were found between the respective baseline scores of the intervention and

no intervention groups on any of the measures; nor between the baseline scores of the different cohorts of intervention.

Insert table 4 about here

Relationship between the mindfulness measures, perceived stress and mental health.

There was a strong relationship between the prisoner and staff combined total scores on the two mindfulness measures (FFMQ & CAMS-R) as expected ($r=.703$; $p<.01$). These measures also correlated with self-reported stress (PSS; $r=-.521$, $p<.01$ & $r=-.446$, $p<.01$) respectively.

Perceived stress correlated highly with the mental health screening total (PHQ-4; $r=.693$, $p<.01$).

Impact of the intervention on mindfulness, stress and cognitive control.

The impact of the intervention was assessed by comparing within-subject baseline and post-intervention scores.

Analysis of the combined prisoner and staff total scores on the two mindfulness measures revealed a significant change between baseline and post-intervention ($n=30$; FFMQ: $F_{1,29} = 8.86$, $p=.006$; $\eta_p^2=.234$; CAMSR: $F_{1,29} = 5.69$, $p=.024$; $\eta_p^2=.164$). This supports the hypothesis that self-reported mindfulness skills will increase over the course of the intervention. Analysis of the FFMQ subscales revealed that the largest changes were recorded on the Observe ($F_{1,29} = 18.38$, $p<.001$; $\eta_p^2=.388$); Describe ($F_{1,29} = 12.55$, $p<.001$; $\eta_p^2=.302$) and Non-react ($F_{1,29} = 5.63$, $p=.025$; $\eta_p^2=.162$) subscales. No differences over time were found on the Awareness and Non-Judgemental subscales.

Analysis of the combined prisoner and staff PSS data showed that stress significantly reduced over time ($F_{1,29} = 19.177, p < .001; \eta_p^2 = .398$). As can be seen in figure 1, staff reported lower stress than prisoners at both baseline and after the intervention. This supports the hypothesis that stress will reduce over the course of the intervention.

Insert figure 1 about here

In contrast to the self-report PSS data, staff had lower HRV (higher physiological stress) at baseline than prisoners. Analyses revealed several significant increases in HRV between baseline and post-intervention for the combined staff and prisoner groups (SDNN, $F(1, 17) = 12.116, p < 0.003, \eta_p^2 = .41$); RMSDD, $F(1, 17) = 12.935, p < 0.002, \eta_p^2 = .43$); RR interval ($F(1, 17) = 6.670, p < 0.019, \eta_p^2 = .28$). This suggests an increase in self regulation and a reduction in the physiological signs of stress over time. Analysis also showed that the stop signal reaction time (SSRT) was significantly faster after the intervention ($n=29; F(1, 27) = 10.537, p < 0.003, \eta_p^2 = .28$).

Intervention effect on employee burnout and mental health.

The slight reductions reported on the Exhaustion and Disengagement scales (burnout) were not significant. In addition, no significant change was found on the mental health brief screening measure (PHQ-4) over time.

Intervention effect on prisoner provocation

The small reduction in the overall provocation score amongst the prisoner cohort was not statistically significant.

Study 1 results summary

Study 1 aimed to assess the impact of a brief mindfulness intervention on staff and prisoners delivered within a prison setting. The data showed that prisoners and staff had similar levels of self-reported mindfulness knowledge and skills prior to the intervention and that for both groups this was significantly enhanced through their participation in the programme. More specifically the intervention was found to increase specific mindfulness skills relating to ‘observing’, and ‘describing’. Those who completed the programme reported significantly less stress, which was also evident in the physiological measures of arousal regulation (heart rate variability). There were no significant changes in employee burnout, simple screening for mental health, nor in relation to anger provocation.

STUDY 2

Hypotheses

It is expected that self-reported mindfulness skills (as measured by the FFMQ and CAMS-R) will be enhanced by participation in a mindfulness group.

Methods

Study design.

A quasi-RCT design was employed whereby men subject to community-based supervision were allocated to the mindfulness or control group.

Ethics and governance considerations.

As with study 1, this research was registered with the HMPPS National Research Committee (Ref. 2016 - 096). Although the participants in the mindfulness group were expected to undertake the mindfulness course as part of their supervision, failure to attend did not result in recall to custody. Participation in the study was voluntary; all participants provided informed

consent and were informed of their right to withdraw from the study at any time before data analysis.

Procedure.

Probation staff and managers recruited individuals who had been released from prison on licence and were being supervised by the participating probation service to the study. All individuals were eligible – no exclusion criteria were applied. Allocation to condition (mindfulness / control) was based on the offender manager they were allocated to; this was based on the standard operating model for case allocation within the service. Data were collected from the mindfulness and control groups in the 4 weeks prior to and 4 weeks after the mindfulness training.

Materials.

The *demographic* data collected from the participants in the mindfulness and control groups were: age; length of order; and offence type, and risk scores.

Mindfulness.

As with study 1, self-reported mindfulness skill was assessed using the *Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2008)*; and the *Cognitive and Affective Mindfulness Scale Revised (CAMS-R; Feldman et al., 2007)*.

Participants.

Of the 65 men starting the mindfulness, 28 completed the programme. All 27 participants in the control group completed at least some of the measures at both time points. While the mindfulness group were significantly older than the control group (44yrs: 40yrs; $t_{53}=-2.95$; $p = 0.005$), there were no significant differences between the groups in terms of length of order. There were

Mindfulness in prison and probation differences in offence type between groups – sexual offences (including possession of indecent images) were more frequent in the mindfulness group (15:2) with burglary and drug and weapon possession more common in the control group (9:2). Analysis (using ANCOVA) of file based risk information showed that overall the mindfulness group were rated lower on a range of risk tools than the control participants after controlling for age and sentence length (Offender Group Reconviction Score (OGRS-3), year 1 ($F_{1,51}=8.242$, $p=0.006$); OASys General Predictor (OGP), year 1 ($F_{1,51}=8.059$; $p=0.006$); OASys Violence Predictor (OVP), year 1 ($F_{1,51}=3.134$; $p=n.s.$)).

Reasons for non-completion of the programme were available for all 37 who left the programme early and included recall to prison for breach of licence conditions ($n=8$); substance misuse ($n=3$); low motivation ($n=12$); starting work ($n=5$) and mental health difficulties (e.g. anxiety, $n=3$; psychosis, $n=2$).

Intervention.

As with study 1, the *Breathe Free* course was delivered to eight groups of men released from prison on license between April 2017 and January 2018. For operational reasons, the programme was shortened to six two-hour sessions per course and the evaluation was limited to mindfulness skills self report only.

Approach to analysis

Statistical analyses were performed using IBM SPSS version 22. Baseline comparisons of demographic and mindfulness factors between the comparison and intervention groups were conducted using T-Tests and analysis of covariance. Hypotheses were examined using repeated measures analysis of variance.

Results

Analyses revealed no significant differences in mindfulness skills for either group between the pre-and post-test periods, although for the mindfulness group, inspection of the effect sizes showed a small to moderate change over time (CAMS-R, $d=0.359$; FFM, $d=0.346$).

Study 2 results summary

Study 2 aimed to examine the impact of mindfulness within probation settings using a quasi-RCT methodology. The mindfulness intervention group showed improvements in mindfulness skills, however, these changes over time did not reach statistical significance. It is important to note that those in the mindfulness condition were older, more likely to have committed a sexual offence and considered to be a lower overall risk). Based on the effect size of the changes found in this study, a power calculation (using $d=0.346$; $\alpha=.05$; $\text{power}=.8$) suggests that future research should aim for at least 60 participants in the treatment group.

GENERAL DISCUSSION

The impact of the programmes

Within both settings (prison and probation) and both group types (prisoners and staff), those participating in the programmes showed increases in scores on the self-reported mindfulness measures, however, these improvements were only significant in the prison groups. Even with a larger sample size in the community group, the much large effect sizes in the prison cohorts suggest that the acquisition of mindfulness skills is greater with the prison group than those in the community. This may be because of the more controlled environment within the prison or differences in levels of engagement, understanding or other factors between the groups.

Although some research has considered the effect of program setting on outcomes (e.g. reasoning and rehabilitation - no difference by setting; Tong & Farrington, 2006; drug treatment – some advantages to community setting; Neale & Saville, 2004) further research is needed to

determine the factors underpinning this potential difference. It is also worth noting that the programme in study 2 was slightly shorter than the prison version (6 vs 8 weeks). There are suggestions in the literature that programmes delivered over a longer period of time may have a greater impact on the wellbeing and behaviour of service users (Auty et al. 2017; Auty, in press).

The data also showed that prisoners and staff had similar levels of mindfulness knowledge and skills prior to the intervention and that, as expected, mindfulness measures correlated highly with one another. Based on this it may be that future researchers employ only one of the measures; the CAMSR where minimising assessment time is most critical and the FFMQ when the profile of mindfulness skills developed is important.

Higher scores on mindfulness were associated with lower scores on perceived stress at baseline. Prisoners reported significantly higher stress levels than did staff, while prison staff were found to have less HRV than the prison group. It should be noted that the staff group comprised 70% women; research suggests that women typically have less HRV than men (Koenig & Thayer, 2016). However, this differences may indicate that prisoners over-report stress (or staff under-report), or that the groups have different levels of awareness of their physiological state (cf interoceptive ability; Garfinkle et al, 2015).

Staff and prisoners in the prison-based mindfulness groups showed significant reductions in levels of perceived stress, in line with findings from other settings (e.g. Martin-Asuero & Garcia-Banda, 2010) and to research in prison contexts which has shown reductions in perceived stress following prison meditation training (Nidich et al, 2016). The findings here, and these previous studies support the claim that mindfulness training can significantly reduce stress in a wide range of populations (Zainal et al., 2013), including prison populations. The measurement of physiological markers of stress and self regulation using heart rate monitoring proved itself to be both practical and acceptable to participants. This suggests that future research could include such measures to augment self-report and other data. Increases in heart

rate variability following the intervention is in line with existing literature which has found increases in HRV associated with mindful breathing in psychology undergraduates (Burg, Wolf & Michalak, 2012) and higher HRV during a cognitive challenge in college students following a four-week mindfulness intervention (Shearer et al, 2015).

The absence of change in the prison groups on the mental health screening tool, burnout and anger provocation were in line with expectations. Whilst these factors have been found to be susceptible to change following mindfulness interventions in some studies (e.g. burnout reduction in teachers, Roeser et al, 2013; self-reported hostility and aggression in some prisoner groups but not others, Fix & Fix, 2013), it was expected that contextual factors and the short duration of the intervention would outweigh the impact of the mindfulness programme in these areas at follow-up. For example, in relation to burnout, Lambert et al (2012) argue that the prison environment may be a stronger predictor of burnout in employees than an individual's disposition, while others (e.g. Keinan and Malach-Pines, 2007) highlight the unique environmental stressors which contribute to burnout faced by prison employees (e.g. physical danger and high levels of responsibility). Therefore it may be that the impact of a brief intervention can act as a stepping stone towards longer / other interventions and broader impacts.

Sample representativeness

Within the prison cohorts, the vast majority (89%) of those who completed the programme provided follow up data. The similarity between the baseline scores of participants starting the mindfulness at different points over the 11 month period suggests that there were no wider contextual factors which led to changes in mindfulness skill and perceived stress over time. In addition, the data from the non-intervention group suggests that those who engaged in the mindfulness programme were typical of a wider group within the prison, however as wider institutional data was not available the representativeness of the study samples could not be

further confirmed. Several factors were measured within the data (i.e. burnout, mental health and anger) with the expectation that these factors would not change within the timeframe (Davies et al, 2010). Thus, the lack of change on the additional factors enables a number of the alternative explanations for the observed changes to be ruled out (i.e. testing induced stress reducing at measurement time 2, responder bias and positive impression management being present at time 2). Together the assessments of the data (intervention baselines over time; intervention vs non-intervention group; no change on specific measures) add to the validity of the findings and provide a basis for concluding that changes recorded within the data reflect changes associated with the intervention provided.

Within the community sample, the intervention group were found to have lower risk profiles than those in the comparison sample. The method used for allocation to groups would suggest that this was an artefact of who was being allocated at any given time. However, this does mean that caution is needed when extrapolating from this community mindfulness group to those on probation who present with higher risk levels. Clearly, further research with larger samples will be needed to test this more fully.

Non-completion

The attrition rates in the studies reported here (prison - 48%; community - 57%) are higher than the 27-38% dropout rates reported in sexual offending and domestic abuse programmes (Olver, Stockdale & Wormith, 2011), but in line with reported dropout rates in ‘Improving Access to Psychological Therapies’ services for those in the general population with common mental health problems such as anxiety and depression (Marshall et al, 2016). Although some drop out is to be expected and might be considered acceptable, further consideration of non-completion is required in future treatment delivery and research in this area. The reasons for non-attendance reported by participants here (such as practical issues and issues of motivation) coupled with ‘drop-out factors’ identified by previous research (e.g. McMurrin & McCulloch, 2007; Murphy

et al, 2013, Marshall et al, 2016) could be useful for this. At a basic level, this might simply require more careful participant selection; providing taster sessions to allow informed decision making about participation; consideration of individual commitment to completion, and strategies to minimise the barriers to attendance. The highest drop out rate was in the prisoner group who were considered ‘challenging’ with respect to their behaviour and engagement. There may be important additional factors and supports that need to be in place to enable similar populations to access and engage with this form of intervention. This might include careful attention to environmental factors (e.g. places to practice skills away from sources of noise and provocation) as well as consideration of the contextual and cultural factors which may influence the implementation of, engagement with and of interventions. Future research may wish to also consider group process and dynamics particularly in relation to the impact these may have on participant retention.

Study limitations and future research.

The pragmatic studies reported here included a number of design features to address potential limitations (e.g. comparison groups; measurement of factors expected not to change). However, future research could attempt to maximise the number of people accessing the intervention whilst having a control group by implementing a stepped wedge approach widely adopted in medical research. This could also help overcome group differences such as the different risk profiles in the community sample. Whilst this would introduce some practical and cost implications, the potential benefits of having a larger group accessing treatment (along with a comparison) could make this worthwhile. However, any future study considering an RCT based design should give careful consideration to the problems associated with randomisation when providing psychological interventions (such as needing to ensure ‘active participation’ and ‘person-intervention fit’; see Davies & Nagi, 2017). With this in mind, a comparison group

comprised of those with no interest in taking part in the intervention (as adopted in study 1 here) may form a useful additional group.

The high dropout rate resulted in the community study being underpowered and consequently reporting non-significant treatment effects. However, the effect sizes observed in this group, suggest that future studies should aim for at least 60 completers in the active group.

An important limitation of this and other published research, is the lack of a longer-term post programme follow up and the limited breadth and types of data used. A number of potentially important domains were not measured and should be considered in future research. For example, studies have reported the beneficial effects of mindfulness on sleep quality and other problems associated with sleeplessness (Sumter et al. 2009) and therefore, data on this could be collected. Further, other domains of measurement (e.g. strengths based measures such as resilience and wellbeing) would be valuable to include. Additionally, collecting behavioural data (e.g. adjudications for prisoners and sickness for staff), alongside self-report, physiological and computer-based measures would be useful.

As well as seeking to replicate and extend this research, future research should seek to understand where mindfulness might best fit within a criminal justice rehabilitation pathway, and whether there are some people who benefit more from this intervention than others (c.f. general and specific responders; Davies & Nagi, 2017). In addition, the increase in cognitive control detected through the computer-based task, along with other assessment of impulsivity may be important avenues for further investigation (see Bell & Polaschek, 2017).

Finally, there is a need to examine the indications that increased mindfulness, lower resting heart rate and greater HRV could be problematic in some offender groups and the implications this could have for providing mindfulness training within correctional settings (De Vries-Bouw et al, 2011; Hansen, et al, 2007; Portnoy & Farrington, 2015; Velotti, Garofalo, Dimaggio & Fonagy, 2019).

Conclusions

The studies reported here demonstrate that brief mindfulness programmes can be delivered within prison and probation contexts and that such interventions can have a positive effect on participants. Together they represent the first ‘real world’ application of a brief mindfulness intervention within both prison (staff and prisoners) and probation settings and provide a foundation on which to build further research in this area. Much larger studies, over a longer time period and using an array of data sources, are now needed to determine the lasting impact that such an intervention could have, and the role mindfulness might have within the criminal justice system.

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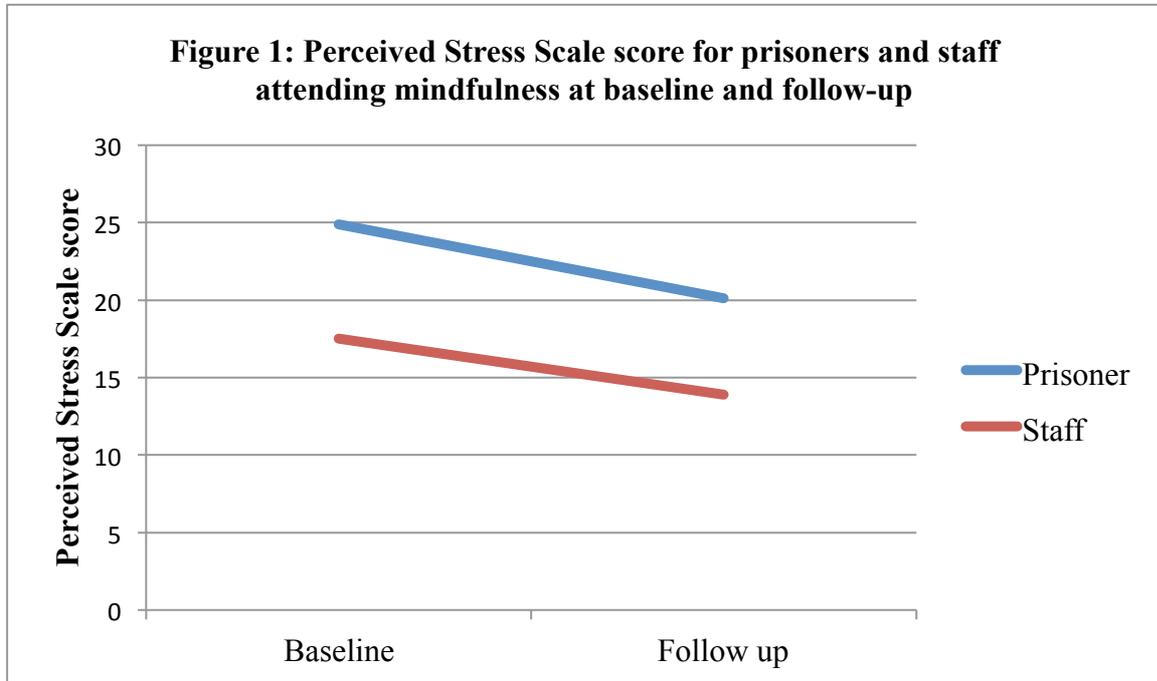


Table 1: Number of participants in each phase of data collection.

			Time period	
			Baseline	Post group
Prisoner	Cohort 1	Intervention	17	8
	Cohort 2	Intervention	15	6
	Cohort 3	Intervention	12	3
		No intervention	9	-
Staff	Cohort 1	Intervention	15	8
	Cohort 2	Intervention	10	7
		No intervention	7	-

NOTE. Cohort data collection dates. Cohort 1 – baseline: May 17, post group: July 17; Cohort 2 – baseline: Sept 17, post group: Feb 17; Cohort 3– baseline: Feb 18, post group: Apr 18; No intervention: Sept 17.

Table 2: Prisoner participant demographic information

		Intervention group (n=44)		Comparison group (n=9)
		Baseline (n=44)	Follow up (n=17)	
Age group	18-25	10 (23%)	4 (23%)	3 (33%)
	26-35	17 (39%)	9 (53%)	4 (44%)
	36-45	10 (23%)	2 (12%)	1 (11%)
	46-55	3 (7%)	1 (6%)	-
	56-65	1 (2%)	1 (6%)	-
	Missing	3 (7%)	-	1 (11%)
	Number of times in prison	3.45 (1-11)	3.12 (1-10)	3.22 (1-12)
Prison History	Number of convictions	12.09 (1-60)	9.71 (1-25)	15 (2-25)
Mean (range)	Current sentence (years)	7.15 (1.2-83.83)	11.10 (2-83)	4.63 (1.5-6.5)
	Time served (months)	23.80 (.5-144)	33.88 (.5-144)	8.06 (3-18)

Table 3: Staff participant demographic information

		Intervention group (n=25)		Comparison group (n=7)
		Baseline (n=25)	Follow-up (n=15)	
Gender	Male	8	4	2
	Female	17	11	5
Age group	18-25	2	1	-
	26-35	6	3	4
	36-45	10	6	2
	46-55	4	3	-
	56-65	3	2	1
Time with service (years)	Mean (range)	7.52 (1-20)	7.75 (1-20)	8.29 (1-17)

Table 4: Baseline scores for prisoners and staff within the intervention and no intervention groups.

Measure	Prisoner		Staff	
	Intervention (n=44)	No intervention (n=9)	Intervention (n=25)	No intervention (n=7)
FFMQ total	114.39 (16.18)	125.39 (27.62)	117.6 (19.12)	130.43 (28.86)
CAMSR total	29.68 (5.89)	30.56 (3.88)	29.2 (3.84)	32.43 (6.65)
PSS	23.23 (7.96)	25.0 (5.22)	18.96 (6.87)	18.0 (3.06)
Stop signal task (SSRT)	268.86 (60.08)	260.15 (47.46)	272.08 (40.67)	249.5 (51.45)
Heart rate				
MeanRR	878.95 (99.11)	-	902.6 (163.33)	885.84(74.61)
SDNN	70.59 (26.97)	-	53.03 (29.40)	54.54(23.65)
RMSSD	40.36 (25.64)	-	43.14 (48.07)	47.09 (29.89)
PHQ total	-	-	7.2 (2.68)	7.43 (2.57)
OLBI				
Disengagement	-	-	18.52 (3.82)	18.0 (3.06)
Exhaustion	-	-	21.08 (3.63)	21.0 (4.97)
NAS-PI	67.86 (15.33)	73.72 (13.11)	-	-