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Breaking the Cycle

Psychological and Cognitive benefits of Yoga among UK Prisoners

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Introduction

This paper reports a recent pioneering study conducted in 7 West Midlands prisons on the effects of a 10-week yoga course on mood, wellbeing, and cognition. The main findings will be discussed, as well as potential implications for yoga as a rehabilitative intervention for incarcerated individuals.

Yoga, which finds its ancestral roots in Hinduism, is widely popular in the West. Its practice usually consists of poses (asanas; physical movement and postures), breathing techniques, and relaxation or meditation. Yoga is associated with numerous physical benefits[1] and, in individuals with psychiatric difficulties, psychological benefits such as the reduction of depression and anxiety.[2] In line with this, findings in the general community have linked yoga to improvements in mood,[3] reductions in anxiety, anger and aggression,[4] and reductions in perceived stress.[5] There is also some indication that yoga practice may have cognitive benefits: for example, yoga improves performance in memory tasks[6] and attention[7] in non-incarcerated samples.

These findings suggest that yoga may be an effective practice in UK prisons, where there is a clear need for interventions that address high rates of psychological problems and reduced wellbeing experienced by prisoners.[8] By addressing known criminogenic agents, including negative affective states,[9] impulsivity, and difficulties regulating emotions,[10] yoga may serve rehabilitative functions and help reduce high rates of re-offending that are observed in the UK[11] and other countries.[12]

Prior research into the effects of yoga within correctional settings is very limited, but promising. Yoga practice has been associated with improvements in psychological symptoms of depression and anxiety in a small group of female prisoners (N=6) who completed a 12-week, bi-weekly Iyengar yoga course.[13] In a larger study conducted in India, 1013 prisoners who completed 15 days of daily yoga, meditation, and

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11. Mnistry of Justice (2012). Criminal Justice Statistics: Quarterly Update to December 2012. London, The Prison Reform Trust (2013). Bromley Briefings — Prison Factfile. London.
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devotional practice reported experiencing improved sleep, mood, and social behaviour.[14] Although positive, it is unclear whether these findings from non-Western cultures may be applicable to prisons in the UK. After all, there are cultural differences in the attitude towards yoga between India and the UK, and the specific format of the classes may also differ. The need for further research in the UK is therefore clear.

There is a different body of research, which overlaps to some extent with yoga practice, focusing on the benefits of meditation and 'mindfulness' in incarcerated samples. These studies suggest that meditation can improve psychosocial functioning,[15] reduce rates of recidivism,[16] and reduce levels of substance use.[17] It's important to consider this work, given that yoga classes frequently involve elements of meditation, such as focussing on the breath. Yoga and meditation may share some mechanisms of action for conferring benefits — including stilling the mind, bringing focus into the present moment, improving emotional awareness and control, and increasing self-esteem.[18]

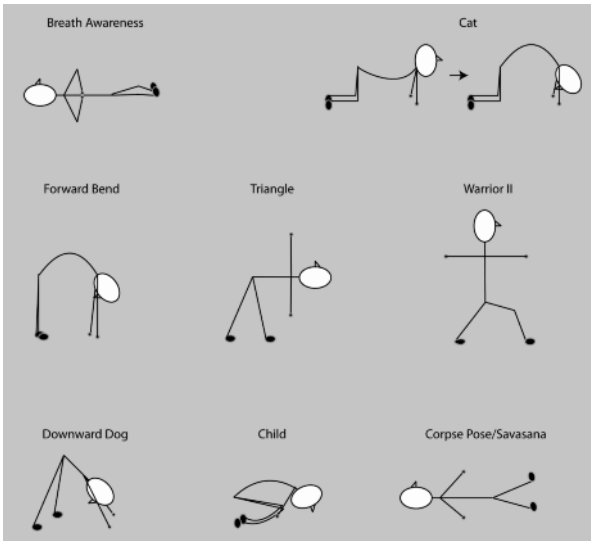
Study Design

The pioneering study we conducted, including an in-depth description of the methods and tasks used, can be seen in our original publication.[19] Here, we will provide key information about our study design and our primary findings.

We aimed to investigate the effects of a 10-week course of yoga in a sample of UK prisoners. We selected a rigorous study design based on a Randomized Controlled Trial (RCT), the gold-standard for intervention research. This involved randomly allocating prisoners to a 'yoga' group or a 'control' (no-yoga) group. Such designs are rarely employed in yoga and meditation research,[20] resulting in a relatively low quality of research in this area. In addition, there is an over-reliance on the use of self-report measures (questionnaires) in prison research, which although potentially effective[21] are limited in their capacity to detect subtle changes in cognition and behaviour. In this study, we addressed this issue by collecting both self-report measures as well as measuring performance variables using a computer-based cognitive task.

Yoga classes were managed by the Prison Phoenix Trust, a charity supporting yoga and meditation in UK and Irish prisons (www.theppt.org.uk). For the current research, yoga classes were held once a week and had a two-hour duration. They were held in a quiet room and consisted of a set of yoga postures and stretches (see Figure 1). To complement the poses, the final 10-20 minutes of each class were spent doing meditation (seated, formal meditation on the breath) and relaxation.

Figure 1: Diagrams of some of the asana poses practised in yoga classes by participants randomly allocated to the yoga group (N=45).



We collected self-report questionnaire measures of mood, stress, and mental health at two time-points, before and after the 10-week course period. Scores provided by participants in the yoga and control groups could then be compared. Self-report questionnaires

14. Bhusan, L. I. (1998) 'Yoga: An Instrument of Psychological Transformation.' *Yoga Magazine*.
15. Chandiramani, K., S. K. Verma, P. L. Dhar and V. Vipasyana Visodhana (1998). *Psychological effects of vipassana on Tihar Jail inmates : research report*. Igatpuri, Nashik, Maharashtra, Vipassana Research Institute, Samuelson, M., J. Carmody, J. Kabat-Zinn and M. A. Bratt (2007). 'Mindfulness-Based Stress Reduction in Massachusetts Correctional Facilities.' *The Prison Journa*l 87(2): 254-268.
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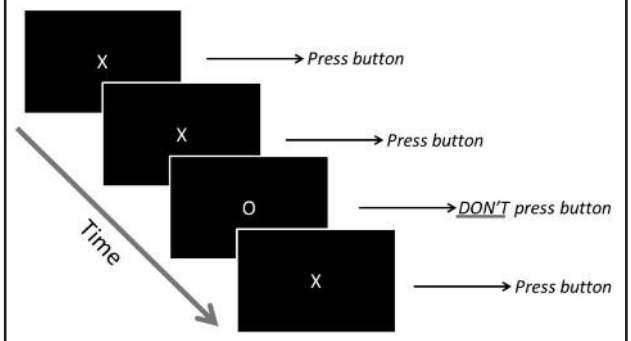
included (1) the Positive and Negative Affect Scale (PANAS);[22] (2) the Perceived Stress Scale (PSS);[23] and (3) the Brief Symptom Inventory (BSI),[24] which measures psychological symptoms of mental distress. We also asked participants to complete the Barratt Impulsiveness Scale or BIS-11,[25] since scores in the BIS-11 have been shown to relate to performance in cognitive-behavioural tasks like the one employed here.[26] We selected these questionnaires because of their ease of use and comprehensibility; all have been used in forensic samples, and/or other vulnerable participant groups, such as those experiencing psychiatric illness.[27]

Participants also completed a computerized 'Go/No-Go' task after the 10-week yoga period. In this task, participants are asked to respond ('Go', 70 per cent of the trials) when they see one cue appear on the screen (the letter 'X'), but must withhold that response ('No-Go', 30 per cent of the trials) when presented with a second cue (the letter 'O'). Figure 2 helps to illustrate our task.

Figure 2. Trial sequence for the Go/No-Go task.



These instructions establish a dominant response tendency to the Go cue, such that more inhibitory cognitive resources are needed to inhibit pre-potent responses on No-Go trials. Thus, this task has been used to tap aspects of executive function related to impulsivity.[28] We know of no previous research that measures, behaviourally, whether yoga might enhance cognitive-behavioural control in prisoners.

Participants

A total of 167 participants (155 male, 12 female) with no previous yoga experience were recruited from prisons in the West Midlands, to take part in a 10-week study (range 16-68; mean 36.08 years). Seven prisons took part in the study,[29] including a young offender's (aged 21-25) and a women's prison. The imprisonment conditions, as well as the crimes committed by participants, varied considerably. For example, the prisoners at one of the prisons (HMP Hewell) were part of the open regime there, which means they were able to leave the prison grounds for work, volunteering, or courses. Another institution (HMP Shrewsbury) had a very high proportion of sex offenders. The study was approved by ethics committees of the British National Health Services and the Ministry of Justice, and all participants provided written informed consent to take part. Individuals assigned to the control group were informed that they would be given priority places in future yoga courses to be run shortly after the completion of the study.

Of the 167 participants, 30.5 per cent (51 individuals) were not present at the second, post-intervention assessment, session and a further 9.5 per cent (16 individuals) attended less than half of the yoga sessions (<5). All these participants were excluded from the analysis. The final sample included 100 participants, 45 of which were in the yoga group, and 55 in the control group.

Results

All statistically significant effects described below are significant at a threshold of $p<0.05$. Where effects were marginally significant ($0.05<p<0.10$) we have reported the corresponding p-values.

For full details of the statistical results and methods employed, we ask readers to consult our original publication, available for free at the website of the Prison Phoenix Trust.[30]

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23. Cohen, S. and G. Williamson (1988). Perceived Stress in a Probability Sample of the United States. *The Social Psychology of Health*. S. Spacapan and S. Oskamp. Newbury Park, CA, Sage.
24. Derogatis, L. R. (1993). *BSI, Brief Symptom Inventory : administration, scoring & procedures manual*. Minneapolis, MN, National Computer Systems.
25. Patton, J. H., M. S. Stanford and E. S. Barratt (1995). 'Factor structure of the Barratt impulsiveness scale.' *J Clin Psychol* 51(6): 768-774.
26. Spinella, M. (2004). 'Neurobehavioral correlates of impulsivity: Evidence of prefrontal involvement.' *International Journal of Neuroscience* 114(1): 95-104.
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28. Band, G. P. H. and G. J. M. van Boxtel (1999). 'Inhibitory motor control in stop paradigms: review and reinterpretation of neural mechanisms.' *Acta Psychologica* 101(2-3): 179-211.
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30. http://www.theppt.org.uk/documents/Bilderbeck_Farias_2013_J_Psych_Res.pdf

Demographics

Our final sample included 100 prisoners, 55 (50 men, 5 women) in the control group, and 45 (43 men, 2 women) in the yoga group. Groups were matched for age, gender composition, and socio-demographic variables (see Table 1), and provided similar measures at baseline (T1) of positive and negative affect, perceived stress, psychological distress, and impulsivity.

Table 1: Participant demographics for 100 participants who either did (yoga group, N=45) or did not (Control group, N=55) participate in a 10-week yoga course. There were no significant differences between the groups.

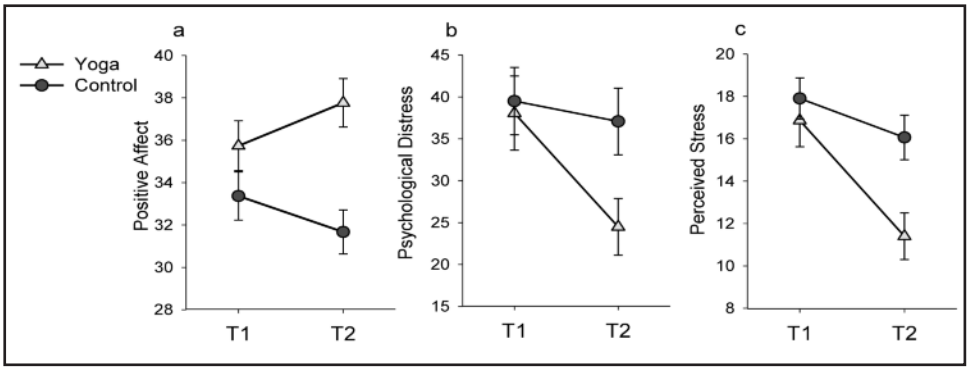
	Yoga	Control
Gender (M / F)	43 / 2	50 / 5
Age (± S.E.)	37.38 (± 1.77)	39.42 (± 1.89)
Education: qualifications obtained		
None	10 (22.2%)	18 (32.7%)
O-levels / GCSEs	21 (46.6%)	13 (23.6%)
A levels and higher education	14 (31.1%)	24 (45.5%)
Ethnicity		
Caucasian	33 (73.3%)	47 (85.5%)
Black	7 (15.5%)	2 (36.4%)
Asian	2 (4.4%)	5 (9.1%)
Mixed	2 (4.4%)	1 (1.8%)
Relationship / Marital status		
Single	24 (53.3%)	24 (43.6%)
Current partner	10 (22.2%)	12 (21.8%)
Married	3 (6.6%)	7 (12.7%)
Divorced	6 (13.3%)	10 (18.2%)
Separated	1(2.2%)	2 (3.6%)
Widowed	1 (2.2%)	-

Questionnaire Measures

Firstly, our results suggested that participation in the yoga course significantly improved positive affect as measured by the PANAS questionnaire. At baseline (Time 1), before the yoga course, participants in the yoga and control groups reported similar levels of positive affect — as would be expected. However, after the 10-week yoga course (Time 2) the yoga group reported significantly higher positive affect than the control group (see Figure 3). Although we found evidence that yoga influences positive affect, as described above, there was no significant evidence for an influence of yoga on negative affect.

The yoga and control participants reported similar levels of perceived stress, and psychological distress, and Time 1. Participation in the yoga course was,

Figure 3. Average ratings of Positive affect using the PANAS (a, left), psychological distress using the Brief Symptom Inventory (b, centre), and perceived stress using the Perceived Stress Scale (c, right) and for 100 prisoner participants who either did (yoga group, light grey triangles, N=45) or did not (control group, dark grey circles, N=55) participate in a 10-week yoga course. Error bars: ± 1 standard error of the mean. T1=Time 1, or baseline. T2=Time 2, or +10 weeks.



however, associated with improvements in both these (see Figure 3a). The yoga group showed a significant decrease in perceived stress at Time 2 compared to Time 1, and a similar significant decrease in psychological distress.

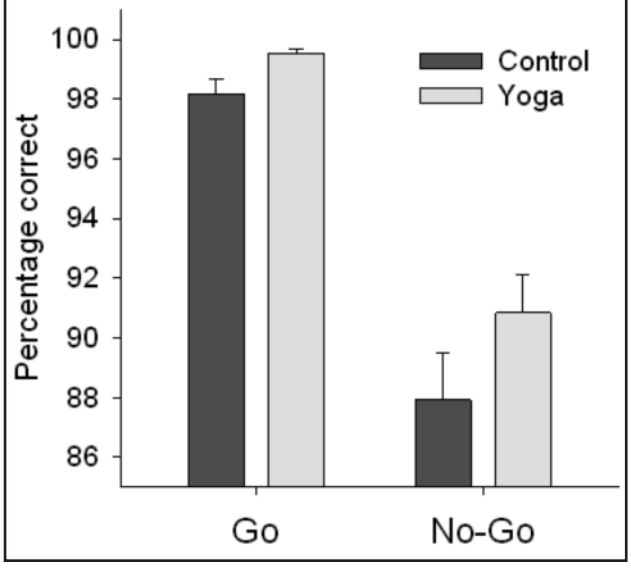
Cognitive-Behavioural task

A subset of 93 participants completed the Go/No-Go task (7 participants did not complete the cognitive task due to technical malfunctions). We excluded from the analysis individuals who had performed more poorly than at chance level in this task (fewer than 50 per cent correct responses over all trials), leading to the removal of 3 datasets (3.2 per cent). Of those remaining, 40 (38 male, 2 female) had participated in the yoga course and 50 (45 male, 5 female) were in the control group. Participants in the two groups remained matched in terms of demographics and trait measures, including trait impulsivity as measured with the BIS-11.

Participants who completed the yoga course showed a significantly higher proportion of correct responses across all trials of the game. When looking separately at 'Go' and 'No-Go' trials (see Figure 4), we found that participants in the yoga group were significantly more likely to make correct button-responses in Go trials. Participants in the yoga group were also more likely to appropriately withhold any response in No-Go trials, but at a marginally significant level, (p=0.072), perhaps because variability of accuracy in these trials was higher than for 'Go' trials.

Across all prisoner participants, and as can be seen in Figure 4, participants tended to be better at making correct button-responses on 'Go' trials than correctly inhibiting responses on 'No-Go' trials. This is similar to what has been reported in previous studies[31] and demonstrates how the task is designed to make it difficult for participants to inhibit motor responses to the No-Go stimuli.

Figure 4. Accuracy in the Go/No-Go task. Average percentage of correct responses for Go and No-Go trials for 90 prisoner participants who either did (yoga group, dark grey bars, N=40) or did not (control group, light grey bars, N=50) participate in a 10-week yoga course. Error bars: + 1 standard error of the mean.



31. de Bruijn, E. R., S. F. Miedl and H. Bekkering (2008). 'Fast responders have blinders on: ERP correlates of response inhibition in competition.' *Cortex* 44(5): 580-586.

Discussion

A case for yoga within prisons

We found that prisoners who had been randomly assigned to attend a ten-week yoga course reported improved mood, reduced stress, and reduced psychological distress, when compared with a control group of prisoners. Furthermore, participants in the yoga group demonstrated improved performance in a cognitive-behavioural task compared to the control group. Together, these results suggest that yoga has beneficial effects on subjective wellbeing and mental health, as well as enhancing cognitive-behavioural functioning. These results represent, to the best of our knowledge, the first evidence of the benefits of yoga in a UK prison population using a randomised, between-groups design, and drawing on behavioural data in addition to self-report measures.

The enhanced performance in our cognitive-behavioural task among participants in the yoga group is particularly compelling. Compared to the control group, prisoners who practised yoga demonstrated significantly greater accuracy during Go trials. Go trials engage simple stimulus-response functions (requiring the participant to press a button when a stimulus, 'X' is presented), and the improved performance on these trials suggests that yoga practice may enhance basic processes of sustained attention and concentration. Also, performance in the yoga group was enhanced on No-Go trials (i.e. correct *inhibition* of the button press response to the 'O' trials). The improved performance on No-Go trials suggests that practising yoga helps prisoners inhibit unhelpful responses and increases their capacity for cognitive control.[32] The fact that the groups did not differ at baseline (T1) helps rule out the possibility of unintended confounding variables influencing our data, and suggest instead that improvements in mood and enhanced cognitive performance are specifically associated with participation in the yoga course.

These results have particular relevance when considering problematic behaviour amongst prisoners. If yoga practice is associated with greater behavioural inhibition, this may mean that yoga helps alleviate problems of reactive aggression and substance abuse. Supporting this idea, previous research has linked general antisociality with impairments in cognitive control[33] and potentially less effective patterns of brain activity in certain experimental tasks.[34] It is therefore possible that, by facilitating cognitive-behavioural control, yoga practice may lead to improved neural processing and, eventually, reductions in the frequency or severity of antisocial acts.

Together, these results suggest that yoga has beneficial effects on subjective wellbeing and mental health, as well as enhancing cognitive-behavioural functioning.

The findings also have implications for policy making. Thus far, research and policy surrounding mental health interventions in prisons has largely focused on psychological and psychosocial treatments. However, interventions provided by psychologists and psychiatrists tend to be costly, and psychosocial treatments in prison can be perceived as inaccessible, stigmatizing, and undesirable because of their time-consuming and emotionally demanding nature.[35] It is possible that alternative interventions, like yoga, may provide a socially acceptable and cost-effective complement to other rehabilitation programmes.

Strengths and limitations of this research

Our findings are consistent with the past literature documenting the beneficial effects of yoga on emotional and psychological wellbeing in healthy volunteers and in clinical samples. Our results also corroborate the very few studies conducted in prisons, where yoga practice has been associated with improvements in psychological symptoms of depression and anxiety,[36] as well as improved sleep, mood, and

32. See n.28.
33. Morgan, A. B. and S. O. Lilienfeld (2000). 'A meta-analytic review of the relation between antisocial behavior and neuropsychological measures of executive function.' *Clinical Psychology Review* 20(1): 113-136, Ogilvie, J. M., A. L. Stewart, R. C. K. Chan and D. H. K. Shum (2011). 'Neuropsychological Measures of Executive Function and Antisocial Behavior: A Meta-Analysis*.' *Criminology* 49(4): 1063-1107.
34. Gao, Y. and A. Raine (2009). 'P3 event-related potential impairments in antisocial and psychopathic individuals: a meta-analysis.' *Biological Psychology* 82(3): 199-210.
35. Marlatt, G. A. and K. Witkiewitz (2002). 'Harm reduction approaches to alcohol use: Health promotion, prevention, and treatment.' *Addictive Behaviors* 27(6): 867-886.
36. See n.13.

social behaviour.[37] Given the methodological limitations of past research, including the lack of a control group, the non-randomization of participants, small sample sizes, and reliance on self-report data,[38] our study represents a significant step towards understanding the effects of yoga in a prison setting.

Other strengths of this study include the recruitment from a number of prisons, including category B and category C prisons, young offender institutions, and one female prison; correspondingly our sample of participants is diverse, and includes individuals with a range of backgrounds and convicted of a range of offenses and of differing severity. Our results are therefore likely to be generalizable to larger population of British prisoners. However, due to various legal and ethical limitations, it was not possible to gather individual information on the nature of offence or the length of sentence of participants, or to recruit participants from category A prisons. These limitations should perhaps be addressed in future studies, to ascertain whether particular offender groups — including those who are considered to be the most dangerous — can benefit from yoga practice.

Future directions

The findings of this study point to the therapeutic and rehabilitative potential for yoga among prisoners. A natural next step would be to conduct longitudinal research to ascertain whether yoga practice within prison was associated with decreased rates of reoffending, perhaps assessed via adjudication records or records of proven convictions. Qualitative research methods could be employed to understand how prisoners experience the potentially transformative effects of yoga. It would also be beneficial to look at neurocognitive changes induced by yoga practice, potentially by using non-invasive techniques like EEG or fMRI. A further question, which remains unanswered, concerns the specific elements of yoga practice which give rise to the benefits observed in studies such as this one. The yoga poses, breathing techniques, or meditation components; the yoga teacher, the social community of the yoga class, and the generalized effects of doing physical exercise, may each have helpful effects and some of these may be more key than others. It may be possible to calibrate these elements in such a way as to 'tailor' yoga classes specifically for prisons, or particular offender groups — for example targeting anger and aggression, or substance abuse, or other compulsive behaviours. Although more research has been conducted on the benefits of meditation-focussed interventions, it is possible that programmes primarily involving yoga have particular strengths in helping to combat restlessness, engaging the body in mindful movement, and building community through class participation. Finally, there is anecdotal evidence through the Prison Phoenix Trust that yoga classes for prison staff can help prison officers to improve personal wellbeing and deal with stressful situations in the workplace. This is also a worthwhile focus for future research.

In sum, we found evidence that yoga significantly improves measures of prisoners' mood and psychological wellbeing, as well as facilitating cognitive processes relating to sustained attention and behavioural inhibition. These changes are indicative of the potential for yoga to influence affect and behavioural regulation in a prison setting. We hope this research will act as a springboard for wider research into the use of yoga within the criminal justice system, and encourage institutions to explore how yoga might be useful within their particular context.

Acknowledgements

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37. See n.14.
38. See n.20, and Birdee, G. S., G. Y. Yeh, P. M. Wayne, R. S. Phillips, R. B. Davis and P. Gardiner (2009). 'Clinical Applications of Yoga for the Pediatric Population: A Systematic Review.' *Academic Pediatrics* 9(4): 212-220.