

Supplementary information

Registered Report: Effects of mindfulness breathing meditation on stress and cognitive functions: A heart rate variability and eye-tracking study

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Appendix 1. Demographic Questionnaires

1. Participant ID (first letter of your surname + first letter of your birth month + last 4 digit of your phone number)

E.g., Surname = Hooi, Birth month = December; Phone no. = 012 - 345 6789

Sample Participant ID = HD6789

2. Age

3. Gender

- ☐ Male
- ☐ Female
- ☐ Prefer not to say

4. Ethnicity

- ☐ Chinese
- ☐ Malay
- ☐ Indian
- ☐ Others (Please specify)

5. Religion

- ☐ Buddhism
- ☐ Islam
- ☐ Hinduism
- ☐ Christianity
- ☐ Others (Please specify)

6. Nationality

- ☐ Malaysian
- ☐ Others (Please specify)

7. Email

8. Experience in meditation practice

- ☐ No
- ☐ Have experience but no current practice
- ☐ Have experience but irregular practice
- ☐ Have experience but somewhat regular practice
- ☐ Have experience and regular practice

9. Do you have any history of mental health or neurological condition(s)?

- ☐ Yes (Please specify)
- ☐ No

Appendix 2. Acceptability Questionnaire

Q1. How this intervention impact or help you in your study/work/home life (e.g., reduce stress level, improve attention etc.)?

Q2. Do you think it is easy or difficult to complete this intervention, and why?

Q3. Please provide an overall rating of how useful the intervention was (1 = not useful to 10 = very useful)

Q4. Please describe why you gave this rating.

Appendix 3. PSS-10

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling how often you felt or thought a certain way.

- (1) In the last month, how often have you been upset because of something that happened unexpectedly?
- (2) In the last month, how often have you felt that you were unable to control the important things in your life?
- (3) In the last month, how often have you felt nervous and stressed?
- (4) In the last month, how often have you felt confident about your ability to handle your personal problems?
- (5) In the last month, how often have you felt that things were going your way?
- (6) In the last month, how often have you found that you could not cope with all the things that you had to do?
- (7) In the last month, how often have you been able to control irritations in your life?
- (8) In the last month, how often have you felt that you were on top of things?
- (9) In the last month, how often have you been angered because of things that happened that were outside of your control?
- (10) In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

Appendix 4. MAQ

- (1) Please indicate the frequency of your meditation practice in the past 7 days.
- (2) Please indicate the average duration of your meditation practice in the past 7 days (in minutes).
- (3) When meditating, how much of the time was your attention focused on what you intended to focus on (body, breath, sounds, etc.)?
- (4) When meditating, how much of the time were you noticing when you were getting distracted?
- (5) When meditating, how much of the time were you practicing an accepting attitude toward what you were experiencing?
- (6) When meditating, how much of the time were you practicing being gentle and compassionate toward yourself?
- (7) In your daily life, how much of the time were you practicing paying attention to everyday activities (e.g., eating, walking, chores, communicating etc.)?
- (8) In your daily life, how much of the time were you practicing paying attention while working or studying?
- (9) In your daily life, how much of the time were you practicing bringing your attention back to what you were doing when it wandered off?
- (10) In your daily life, how much of the time were you practicing being aware of your thoughts, emotions, and reactions?
- (11) In your daily life, how much of the time were you practicing bringing an accepting attitude towards what you were experiencing?
- (12) In your daily life, how much of the time were you practicing being gentle and compassionate toward yourself?

Appendix 5. NEQ

Incidents and effects

1. I had more problems with my sleep
2. I felt like I was under more stress
3. I experienced more anxiety
4. I felt more worried
5. I experienced more hopelessness
6. I experienced more unpleasant feelings
7. I felt that the issue I was looking for help with got worse
8. Unpleasant memories resurfaced
9. I got thoughts that it would be better if I did not exist anymore and that I should take my own life
10. I stopped thinking that things could get better
11. I started thinking that the issue I was seeking help for could not be made any better
12. I felt that the intervention did not produce any results
13. I felt that the intervention was not motivating

Did you experience this (items 1 -13)?

- No
- Yes

If yes, how negatively does it affect you?

- Not at all
- Slightly
- Moderately
- Very
- Extremely

Probably caused by?

- The intervention received
- Other circumstances

Q: Is there any other incidents or effects?

Please describe in your own words whether there were any other negative incidents or effects, and what characterized them.

Appendix 6. Weekly Log Sheet for Active Control Condition

1. Participant ID
2. Today's date
3. Please indicate the frequency of your daily music listening task in the past 7 days.

Appendix 7. Script for 4-4-4-4 Breathing Meditation

Sit up straight in any meditative posture.

You may do it with your eyes closed.

Breathe in to a count of 4.

Hold your breath to a count of 4.

Breathe out to a count of 4.

Hold your breath to a count of 4.

Let's do it for a few times again.

Breathe in.

Hold your breath.

Breathe out.

Hold your breath.

Breathe in.

Hold your breath.

Breathe out.

Hold your breath.

Breathe in.

Hold your breath.

Breathe out.

Hold your breath.

Take a normal breath in and out.

You will notice a soothing and relaxing effect promptly.

You may now gently open your eyes.

Appendix 8. Kapalabhati Pranayama

The word “Kapalabhati” is made up of two Sanskrit words, i.e., kapala meaning “skull” and bhati meaning “shining”. Kapalabhati Pranayama involves active and rapid inhalation and exhalation. On exhalation, the belly-button area will be pulled inwards and towards the spine, whereas on inhalation will release it and relax. It is one of the yogic and purification breathing meditation techniques which cleanses the internal physiological system such as the nervous and respiratory systems, detoxifies and invigorates the body and mind¹⁷⁴. Kapalabhati Pranayama is regarded as the “skull-shining” breathing meditation due to its rapid and forceful exhalation technique which generates a “Venturi Effect” that produces a vacuum in the nasal cavity that removes all the impurities (e.g., toxins, phlegm, mucus) from the brain and body which cannot be usually eliminated through the detoxification organ and normal exhalation¹⁷⁵. Therefore, this suggests that the brain can function more effectively and may enhance cognitive performance after performing Kapalabhati Pranayama. The female participants were told to avoid doing Kapalabhati Pranayama during their menstrual period, as forcefully contracting the abdominal muscles while doing the Kapalabhati Pranayama may cause discomfort.

Appendix 9. Script for Kapalabhati Pranayama

In Kapalabhati, we breath rapidly and actively.

On exhalation we pull our navel area in towards the spine.

On inhalation, we release it and breath normally.

Sit up straight in any meditative posture and close your eyes.

Take a long deep breath in, and exhale.

For Kapalabhati, breath in, out, in, out, in, out, in, out, in, out, in, out, in, out, in, out, in, out

And relax.

Keeping the eye close, feel the effect of Kapalabhati.

Let's do it one more time.

Take a full breath in, and exhale.

Breath in, out, in, out, in, out, in, out, in, out, in, out, in, out, in, out, in, out

And relax.

You may gently open your eyes.

Appendix 10. Bhastrika Pranayama

Bhastrika Pranayama involves rapid inhalation and exhalation which gives a boost to the body and thus, it is aptly regarded as the yogic breath of fire. Bhastrika Pranayama is also considered as the oxygen-based breathing technique, in which it helps to maximize the lung capacity and fills up the lung with more oxygen while doing it¹⁷⁶. The participants were told to sit in Vajrasana pose. This was because sitting in Vajrasana pose would allow a better diaphragmatic movement and automatically erected the spine; thus, increased the effectiveness of Pranayama.

Appendix 11. Script for Bhastrika Pranayama

First, sit in Vajrasana pose.

Palms on your laps, facing upwards.

Let's close your eyes.

Take a normal breath in, and exhale.

Both hands in a loose fist, beside your shoulders.

As you breath in, your arms go up and open up.

As you breath out, your arms come down and make a fist again.

For Bhastrika, breath in, out, in, out, in, out, in, out, in, out, in, out, in, out, in, out, in, out.

And relax.

Palms on your laps, facing upwards.

Remains your eyes closed.

Observe any sensation that occurs in your body.

Feels the increased energy levels in you.

Feel the quietness of your mind.

Let's do it one more time.

Take a full breath in, and exhale.

Breath in, out, in, out, in, out, in, out, in, out, in, out, in, out, in, out, in, out.

And relax.

Slowly open your eyes.

Very gently straighten your legs in front of you.

Appendix 12. Nadishodhan Pranayama

Nadishodhan Pranayama is made up of two Sanskrit words, i.e., nadi meaning “flow” or “channel”, and shodhan meaning “purification”¹⁷⁷. Nadishodhan Pranayama is also known as the alternate nostril breathing meditation technique, as it involves a cycle of breathing with only one nostril to breathe in a time which changes from the left nostril to the right nostril. The participants were reminded to avoid practicing Nadishodhan Pranayama in the condition of running nose. This is because Nadishodhan Pranayama involves blocking one nostril while doing it which may result in breathing difficulties especially during the condition of running nose.

Appendix 13. Script for Nadishodhan Pranayama

Sit up straight in any meditative posture.

Let's keep your left hand in chin mudra.

Index finger and the thumb are touching gently, last 3 fingers are together and outstretched.

Right hand's index finger and middle finger touching in between the eyebrows.

Thumb gently touching on the right nostril.

Ring and little fingers gently touching on the left nostril.

Let's take a breath in.

Breath out from the left nostril with thumb pressing on the right nostril.

Breath in through the left again.

Breath out from the right nostril with ring and little fingers pressing on the left nostril.

Breath in through the right.

Breath out from the left.

Breath in through the left.

Breath out from the right.

Breath in through the right.

Breath out from the left.

Breath in through the left.

Breath out from the right.

Breath in through the right.

Breath out from the left.

Breath in through the left.

Breath out from the right.

Breath in through the right.

Breath out from the left.

Joyfully and mindfully via breathing, with your mind fully on the breath and in between your eyebrows.

You may relax and put down your hands.

Palms on your laps and facing upwards.

Keep your eyes closed.

Feel the sensation.

You may notice a sense of calm in your body and mind.

You may now gently open your eyes.

Appendix 14. Bhramari Pranayama

The word Bhramari is made up of Sanskrit word, which has the meaning of “bee”, as Bhramari Pranayama involves a high-pitched humming sound like a bee. Bhramari Pranayama is effective in instantly calming down the mind¹⁷⁸. It is one of the best breathing exercises to free the mind of agitation, frustration or anxiety and get rid of anger to a great extent¹⁷⁹. The science behind Bhramari Pranayama is that it works on calming the nerves and soothes them especially around the brain and the forehead¹⁸⁰. Besides that, the humming sound vibrations have a natural calming effect on the mind⁵².

Appendix 15. Script for Bhramari Pranayama

In Bhramari, we will do a high-pitched humming sound like a bee.

Use your index fingers to close and open the flap of your ears (the cartilage), as you are making the humming sound.

Sit up straight and keep your eyes closed.

As you breath out, make the humming sound while opening and closing the flap of your ears using your index finger.

When you fully breath out, breath in again.

Let's have a deep breath in.

Breath out. (humming sound)

Breath in.

Breath out. (humming sound)

Breath in.

Breath out. (humming sound)

And relax.

Palms on your laps and facing upwards.

Keeping your eyes closed.

Let's take a deep breath in.

And breath out.

Feel the stillness and silence.

You may now gently open your eyes.