HOLZEL ET AL

PSYCHOLOGY BEING INVESTIGATED

MINDFULNESS

Stress reduction to increase well-being. It helps develop awareness of the present and promotes compassionate and non-judgemental behaviour. It's widely used in treatments like anxiety and chronic pain and to help those who suffer from substance abuse/addictions.

LOCALISATION OF FUNCTION

The idea that certain brain structures are responsible for specific cognitions. Eg: Hippocampus: memories & emotions, Insula: partly responsible for awareness. functions of brain structures are determined by monitoring how those structures change with certain practices. These changes are called structural plasticity and are quantified by VBM and measured by MRI scans.

BACKGROUND

MBSR

Mindfulness-based stress reduction; this program was 8 weeks long, with 2.5 hour weekly group meetings + one 6.5-hour training every day. In group meetings, 3 techniques people should practice daily: 1. BODY SCANNING: being conscious about sensations in one's body; awareness of one's body and surroundings. 2. MINDFUL YOGA: gentle stretching, coordinated, slow movements & breathing focusing on each moment to develop awareness of the body's strengths and limitations. 3. MEDITATION: awareness of sensations of breathing & sensory information and emotions; developing full awareness.

MEASURING CHANGES IN MINDFULNESS

FFMQ [Five Facets of Mindfulness Questionnaire] made to measure changes in the 5 key areas of mindfulness: 1. Observe & 2. Describe thoughts and feelings 3. Non-judgementally, 4. Non-reactively & 5. Awareness of actions. Each facet is positively correlated with well-being. Unclear how this is true, but brain scans reveal the structures involved in this.

PREVIOUS RESEARCH ON THE LOCALISATION OF FUNCTION

Meditators' grey matter concentration [GMC] > non-meditators' GMC, specifically in the hippocampus and insula. Longitudinal studies show that GMC increases as new skills are learned. Therefore, changes in well-being are directly linked to changes in GMC.

MEASURING CHANGES IN GMC BY VBM

VBM: voxel [volume+pixel, tiny cubic measurement to find volume of 3D objects] based morphometry. VBM used to compare relative brain structure sizes & to monitor changes in brain structures over time. It's done by segmenting the types of tissue on the image, mapping images onto a template to control the individual differences between brains and technologically smoothing to increase validity.

AIM

1. To identify if MBSR leads to measurable neurological changes which might be associated with trait changes related to mindfulness practice.
2. To identify brain structures which changed due to an eight-week MBSR programme.

RESEARCH METHODOLOGY

Looking for the causal relationship between MBSR & GMC in brain structures. One part of the study was correlation though, as investigators wanted to check if there wasn't a causal relationship. Some parts of the experiment were controlled, like MRI scans; the rest were in natural environments.

DESIGN & VARIABLES

IV	Whether Ps received MBSR	whether the data was collected at the beginning / end of the 8-week period	
DV	GMC in brain structures.	FFMQ answers to 39 questions	Time spent on mindfulness exercises between weekly sessions.

Longitudinal design; collecting data over eight weeks. Ps provided two data sets at the beginning & end of the eight weeks. The study also used an independent measures design, including two groups: an experimental group attending weekly MBSR sessions & a control group.

SAMPLE

Opportunity sample of 33 healthy adults aged 25-55 years old from four (MBSR) courses at the Center for Mindfulness in New England, USA. They were either self-referred or recommended by their doctors due to stress. 6 Ms & 10 Fs [avg age: 38] were in the MBSR group & 11 Ms & 6 Fs [avg age: 38] were

assigned to the control group. All had limited meditation experience. The course fee was reduced for participation, & Ps agreed to attend the full eight-week program.

PROCEDURE

BEFORE THE MBSR SESSIONS

MRI scans & digital models of the brain were created two weeks before the MBSR session & analysed by VBM to measure GMC in regions of interest & the brain as a whole. The model was made by taking pictures of the 128 sagittal slices [from the top to the bottom] & then combining them using software.

DURING THE MBSR SESSIONS

The experimental group participated in eight weekly MBSR sessions at the University of Massachusetts Medical School. They were given a 45-minute audio using guided exercises like body scans, yoga, & meditation for home use.

AFTER THE MBSR SESSIONS

MRI scans & FFMQ were taken two weeks after MBSR session, comparing GMC & mindfulness scores using VBM software.

RESULTS

AMOUNT OF MINDFULNESS PRACTICE

Average of 22.6 hours spent on MBSR sessions, SD- 6.3 hrs. The most time was spent on body scanning, with Ps spending more than twice as much time on this than yoga or meditation.

IMPROVEMENTS IN MINDFULNESS

Significant improvements in 'acting with awareness', 'observing', & 'non-judging' after MBSR training compared to the control group, but not in 'describing' or 'non-reactivity'.

GREY MATTER CHANGES

The MBSR group showed a significant increase in GMC in their left hippocampus, posterior cingulate cortex, temporoparietal junction, & cerebellum compared to the control group. These differences were due to the MBSR training, not individual differences. No significant difference was found in GMC in the insulae before or after MBSR, suggesting regular practice is more important than time spent on mindfulness.

CONCLUSION

Hölzel et al. found that regular mindfulness practice can lead to structural changes in key brain regions, including the left hippocampus, posterior cingulate cortex, temporal-parietal junction, & cerebellum, affecting learning, memory, emotion regulation, & perspective-taking. However, these changes may require more than eight weeks of practice.

ETHICAL ISSUES

PROTECTION FROM HARM

The study ensured Ps' safety by avoiding metallic implants, claustrophobia, & discomfort in the scanner. Ps were allowed to withdraw after the first scan due to discomfort. The waitlist control group also received MBSR, demonstrating the researchers' respect for their Ps' well-being.

METHODOLOGICAL ISSUES

RELIABILITY

Lack of standardisation

The study's weakness lies in its lack of standardization between weekly mindfulness sessions, as Ps chose exercises & locations, resulting in inconsistent GMC post-intervention, potentially affecting reliability.

Internal consistency in the questionnaire

Utilised the highly reliable FFMQ, which accurately assessed 'acting with awareness' before & after the MBSR program, demonstrating a strong positive correlation.

VALIDITY

Experimental method & design

The use of IMD allowed researchers to measure changes in GMC for the control group to compare with the experimental group. This lets researchers determine that changes in GMC were because of MBSR & not just changes in daily routine.

Confounding variables

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The absence of control over CVs, like the exp group's benefits of mindfulness & exercise, could potentially affect the study's validity.

Self Report

The study's weakness lies in using self-reported quantitative data on the FFMQ, which can lead to a response set, reducing the validity of answers & questioning the correlation between self-reported mindfulness traits & GMC.

OBJECTIVITY & PRECISION

Use of quantitative data

Utilized quantitative data to measure GMC, utilizing VBM & specialist computer software for objective analysis, eliminating the need for interpretation.

GENERALISATION & ECOLOGICAL VALIDITY

Generalising beyond the sample

The study's limitation is its limited sample size of 33 Ps, limiting its ability to explore the impact of mindfulness on GMC in a wider population, especially older adults or those with lower formal education levels.

Generalising to everyday life

Hölzel et al.'s study highlights the importance of incorporating mindfulness into daily routines, thereby ensuring greater ecological validity & potential for similar changes in brain structure in other individuals.

ISSUES & DEBATES

NATURE VS NURTURE

The study supports nature's role in brain development, highlighting the control of synaptogenesis by genes. It also suggests that regular mindfulness practice can influence biology & nature, increasing GMC in specific brain structures. This suggests that even those with stress predisposition can experience improved well-being.

APPLICATIONS TO EVERYDAY LIFE

Global stress levels are high, making mindfulness in schools & workplaces crucial. Regular practice of mindfulness-focused relaxation techniques (MBSR) can trigger neural changes, improve well-being, & increase productivity. Education providers & employers can invest in children's psychological well-being & build good habits.

Similarities	Differences
Holzel et al. & D&K used brain scanning	Holzel used IDM, D&K used rep. measures
Holzel & Hasset et al. used Ps in their real-life settings	Holzel: brain changes after MBSR [nurture] & Hassett: sex's role in biological difference [nature].

Strengths	Weaknesses
Use of a control group increased validity of the conclusion that MBSR caused an increase in GMC in certain brain structures.	Lack of st&ardisation between the weekly mindfulness sessions - Ps chose exercises & their duration daily.
Qt data from voxel-based morphometry was objective	Self-report data from (FFMQ) was subjective.

ASSUMPTIONS

Changes in brain structure following mindfulness training show how similarities & differences between people can be understood in terms of biological factors & their interaction with other factors.