## Holzel et al 2011

**Background:**

Before Holzel experiment, meditation had been used in therapies for people with anxiety problems and depression, substance abuse, eating disorders and chronic pain.

The neural mechanism that might be part of the practice of mindfulness meditation had been researched by conducting neuroimaging studies.

Holzel provided an overview of 6 studies that measured either cortical thickness or grey matter/ All 6 studies showed a difference between Ps in the mindful meditation group and those in the control group.

2 areas affected the MOST: hippocampus and the right anterior insula

Holzel used a longitudinal study design to track changes across all participants over time.

PSYCHOLOGY BEING INVESTIGATED:

Mindfulness is a human ability to be fully aware of who we are, where we are, and what are we doing. It is a skill to not become overwhelmed by everything that's happening around us.

**Holzel et al define it as** "the development of awareness of present moment **experience with a compassionate, non-judgmental stance"**

**Localization of function:**

Refers to how different parts of the brain perform specific functions. For example, our **hippocampus** is the part of the brain that deals with learning, memory, some emotional control, and spatial navigation. The **amygdala** is a different part of the brain and helps in the processing of fearful and threatening stimuli

**It may change** brain density, increased brain volume, **increased performance ability**

**What is the AIM of the study?**

To investigate the potential long term effect of a mindfulness-based stress reduction program on a brain gray matter density.

METHOD:

**Participants**

Recruited for the experimental group were from those enrolled-on Mindfulness-Based Stress Reduction (MBSR) courses held at the Center for Mindfulness at the University of Massachusetts Medical School. They had either been referred to the programmed by their physician or had referred themselves.

**They also had to meet the following criteria.**

They must:

1) Be physically and psychologically healthy
2) No prescription medication
3) No meditation classes in previous 6 months
4) Have had no more than 4 meditation classes in the last 5 years
5) Have nothing to prevent MRI scan (implant/ metal/ clausterphobia)
6) Have a commitment to attend all 8 MBSR lessons
7) Complete the HMWRK (audio 45 minutes)
8) Be right-handed

## PARTICIPANTS (TOTAL OF 18)

- Experimental Group
  - N=16 (2 withdrew)
  - 6 males and 10 females
  - Mean age 38
  - 13 Caucasians, 1 Asian, 1 African American, 1 Multiethnic
- Control Group
  - N=17
  - 11 males and 6 females
  - Mean age 39
  - Majority Caucasian, 1 Hispanic, 1 Asian, 1 African American
  - Average years of education=17

All participants gave informed consent

## PROCEDURE:

**The MBSR (mindfulness-based stress reduction) Program** consisted of 8 wks of group meetings that lasted 2.5 hrs. In the 6th week of the course, participants had one full day (6.5 hours).

**There are 3 elements to the program.**

1) **Body scan-** the aim was to get P's to feel body as a whole, guided thrugh the body, aware of any sensations

2) **Mindful Yoga-** gentle stretching exercise thrugh slow movement coordinated with breathing patterns

3) **Sitting meditation-** includes awareness of the sensation of breathing / awareness mediation which says you feel and pay attention to anything that comes into my awareness.

They were given audio recading of 45 mins created to be used at home. Also asked to practice throughout the day informally.

## OUTCOME: 2 MEASURES TAKEN FOR ALL P'S

- Self report

FFMQ: five facet mindfulness questionnaire, 39 item scale to measure five factors of mindfulness.

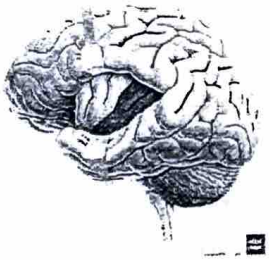
- 1 observing (noticing internal and external stimuli).
- 2 Describing (mentally labeled stimuli of your actions).
- 3 Acting With awareness (measures ability to attend to your own current actions).
- 4 (nonjudging of inner experiences)

# What does the INSULA DO?

The insular cortex is located deep within the lateral sulcus of the brain. Also known as the "Island" - a region of cortex not visible from the surface view.

The insula is important for gustatory (taste sense) and sensorimotor processing, risk-reward behavior, autonomics, pain pathways, and auditory and vestibular functioning.

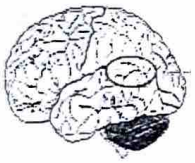
It is because of insula that people can perceive pain and have the awareness about their body and self



## Posterior Cingulate Cortex

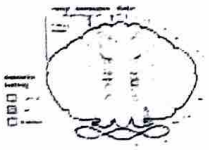
PCC has a central role in supporting internally directed cognition The PCC shows increased activity when individuals retrieve autobiographical memories or planning in the future, as well as during unconstrained 'rest' when activity in the brain can be thought of as cognitively 'free wheeling'. However, other evidence suggests that the PCC plays a more direct role in regulating the focus of attention

## Temporoparietal



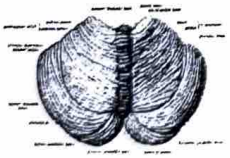
The **temporoparietal junction** (TPJ) is an area of the brain where the temporal and parietal lobes meet, at the posterior end of the lateral sulcus (Sylvian fissure). The TPJ incorporates information from the thalamus and the limbic system as well as from the visual, auditory, and somatosensory systems. The TPJ also integrates information from both the external environment as well as from within the body. The TPJ is responsible for collecting of this information and then processing it

## Lateral area of cerebellar hemisphere



The remaining **lateral area of each cerebellar hemisphere** provides the planning of sequential movements of the entire body, along with involvement in the conscious assessment of movement errors.

## Cerebellar vermis brainstem



The cerebellum attaches to the brainstem by three groups of nerve fibers called the superior, middle and inferior cerebellar peduncles, through which efferent and afferent fibers pass to connect with the rest of the nervous system. The vermis area coordinates the movements of the central body (e.g., trunk, head, proximal limbs) and the paravermis area coordinates movement from the distal limbs (e.g., arms, legs, fingers, toes).

### Five Facet Mindfulness Questionnaire - 15 (FFMQ-15)

Instructions

Please use the descriptions provided to indicate how true the below statements are of you. Select the option which represents your own opinion of what is generally true for you.

| | | Never or very rarely true | Rarely true | Sometimes true | Often true | Very often or always true |
|---|---|---|---|---|---|---|
| 1 | When I take a shower or a bath, I stay alert to the sensations of water on my body. | 1 | 2 | 3 | 4 | 5 |
| 2 | I'm good at finding words to describe my feelings. | 1 | 2 | 3 | 4 | 5 |
| 3 | I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted. | 5 | 4 | 3 | 2 | 1 |
| 4 | I believe some of my thoughts are abnormal or bad and I shouldn't think that way. | 5 | 4 | 3 | 2 | 1 |
| 5 | When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting lost in it. | 1 | 2 | 3 | 4 | 5 |
| 6 | I notice how foods and drinks affect my thoughts, bodily sensations, and emotions. | 1 | 2 | 3 | 4 | 5 |
| 7 | I have trouble thinking of the right words to express how I feel about things. | 5 | 4 | 3 | 2 | 1 |
| 8 | I do jobs or tasks automatically, without being aware of what I'm doing. | 5 | 4 | 3 | 2 | 1 |
| 9 | I think some of my emotions are bad or inappropriate and I shouldn't feel them. | 5 | 4 | 3 | 2 | 1 |
| 10 | When I have distressing thoughts or images I am able just to notice them without reacting. | 1 | 2 | 3 | 4 | 5 |
| 11 | I pay attention to sensations, such as the wind in my hair or sun on my face. | 1 | 2 | 3 | 4 | 5 |
| 12 | I when when I'm feeling terribly upset I can find a way to put it into words. | 1 | 2 | 3 | 4 | 5 |
| 13 | I find myself doing things without paying attention. | 5 | 4 | 3 | 2 | 1 |
| 14 | I tell myself I shouldn't be feeling the way I'm feeling. | 5 | 4 | 3 | 2 | 1 |
| 15 | When I have distressing thoughts or images I just notice them and let them go. | 1 | 2 | 3 | 4 | 5 |

The five subscales are:

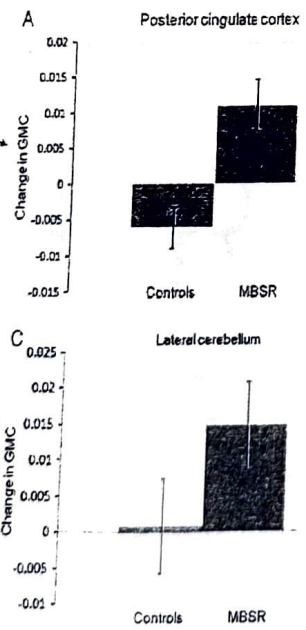
- **Observation** (items 1, 6, 11): how we see, feel and perceive the internal and external world around us and select the stimuli that require our attention and focus.
- **Description** (items 2, 7, 12): the way we label our experiences and express them in words to ourselves and others.
- **Acting with Awareness** (items 3, 8, 13): the movements we choose after attending to the information present at the moment. Determines whether we act out of quick judgment and get out of 'autopilot mode' before responding to a situation.
- **Non-judgmental** (items 4, 9, 14): ability to be non-judgmental regarding our inner experience. It measures self-acceptance and empathy for oneself and others.
- **Non-reactivity** (items 5, 10, 15): active detachment from negative thoughts and emotions so that we can accept their existence and choose not to react to them.

# RESULTS

The amount

| MBSR COMPONENT | AVERAGE time (range) |
|---|---|
| Engaged in formal homework | 22.6 hours |
| Body Scan Practice | 699 minutes<br>Range= (335-775) |
| Mindful Yoga | 327 minutes<br>Range = (103-775) |
| Sitting meditation | 332 minutes<br>Range = (0-755) |

Change in BRAIN GREY MATTER




Conclusion

# SUMMARY

| | |
|---|---|
| RESEARCH METHOD (main) | Experiment using LONGITUDINAL design |
| Other techniques | Self report and brain scans |
| Sample | 16 participants in the MBSR group (originally 18 but 2 withdrew)<br>17 Participants in the control group |
| Sampling Technique | People enrolled in MBSR-Volunteer sample |
| Experimental Design | Independent Measures |
| IV | MBSR and control group |
| DV | FFMQ (5 sub scales) voxel based morphometry scores |
| Quantitative Data | (FFMQ sub scale and Morphometry scores) |
| Qualitative DATA | n/a |

# EVALUATION

| Evaluation | General Eval | Related to Holzel et al |
|---|---|---|
| Strength | High levels of standardization for replicability | Specified procedures; contents of the MBSR program, examining specifics regions of interest |
| Strength | Experiments have high levels of controls; increase confidence it is the IV directly affecting the DV | Confident that the mindfulness program itself changed brain grey matter |
| Weakness | Questionnaires (socially desirable answers)lowers validity of findings | Completion of FFMQ before and after program might have made P's rate different based on social desirability (as if program worked). |
| Weakness | If questionnaires had closed questions Ps might choose an answer that doesn't reflect their opinion | 5 factor scale used on the FFMQ may NOT have a choice, lowering the validity of the findings |

## ISSUES AND DEBATES

| | |
|---|---|
| Application to everyday life | Useful for those experiencing memory Problems. Enroll in MBSR program to help them increase hippocampus density. |
| Individual and Situational Explanations | Both sides of the argument can be seen in this study: Individual personality types may be more or less successful. Situational—the "situation" of being involved in the MBSR Program has effect on brain. |
| Nature V Nurture | Nature= increase in grey matter<br>Nurture= experience of the MBSR training thathad an effect on brain structure |
| Use of children | n/a |
| Use of animals | n/a |