



Know the mind.

Shape the mind.

Free the mind.

The Neurology of Awakening:

Using the New Brain Research to Steady Your Mind

Spirit Rock Meditation Center

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www.WiseBrain.org



Foundations

Practice (like a three-legged stool)

- **Loving** – compassion, kindness (*metta*)
- **Knowing** – mindfulness, comprehension (*sati*)
- **Growing** – healing, developing (*bhavana*)

Three Fields of Practice

- **Virtue** – morality, character, goodness (*sila*)
- **Concentration** – absorption, purification (*samadhi*)
- **Wisdom** – insight, disenchantment (*panna*)

*Concentration is
the proximate cause of wisdom.*

*Without concentration, one cannot even secure
one's own welfare, much less the lofty goal of
providing for the welfare of others.*

Acariya Dhammapala

Seven Processes of Awakening

- **Steadying the mind**
- **Warming the heart**
- **Resting in fullness**
- **Enjoying wholeness**
- **Receiving nowness**
- **Opening into allness**
- **Finding timelessness**



Some Factors for Steadying the Mind

Basics of Meditation


- Relax
- Posture that is comfortable and alert
- Simple good will toward yourself
- Awareness of your body
- Focus on something to steady your attention
- Accepting whatever passes through awareness, not resisting it or chasing it
- Gently settling into peaceful well-being

Some Factors of Steadiness

- Intending to be steady
- Easing the body
- Opening the heart
- Feeling as safe as you can
- Encouraging positive emotions

Neural Basis of Mindfulness Factors

- **Intention** – “top-down” frontal, “bottom-up” limbic and cerebellum
- **Relaxation** – parasympathetic nervous system (PNS)
- **Warmth** – social engagement system, vagus nerve, PNS
- **Safety** – calms amygdala alarms, reduces stress and vigilance
- **Positive emotion** – dopamine, norepinephrine, opioids: calming, motivating, wakeful, increasing internalization



Bodyful of Mind

A Framework

Experiences are happening: thoughts, feelings, awareness.


Matter seems to exist: water, light, bodies, brains.

Information seems to exist, represented by matter; the function of the nervous system is to process information.

Experiences – consciousness – seem to be enabled by information processing in the nervous system.

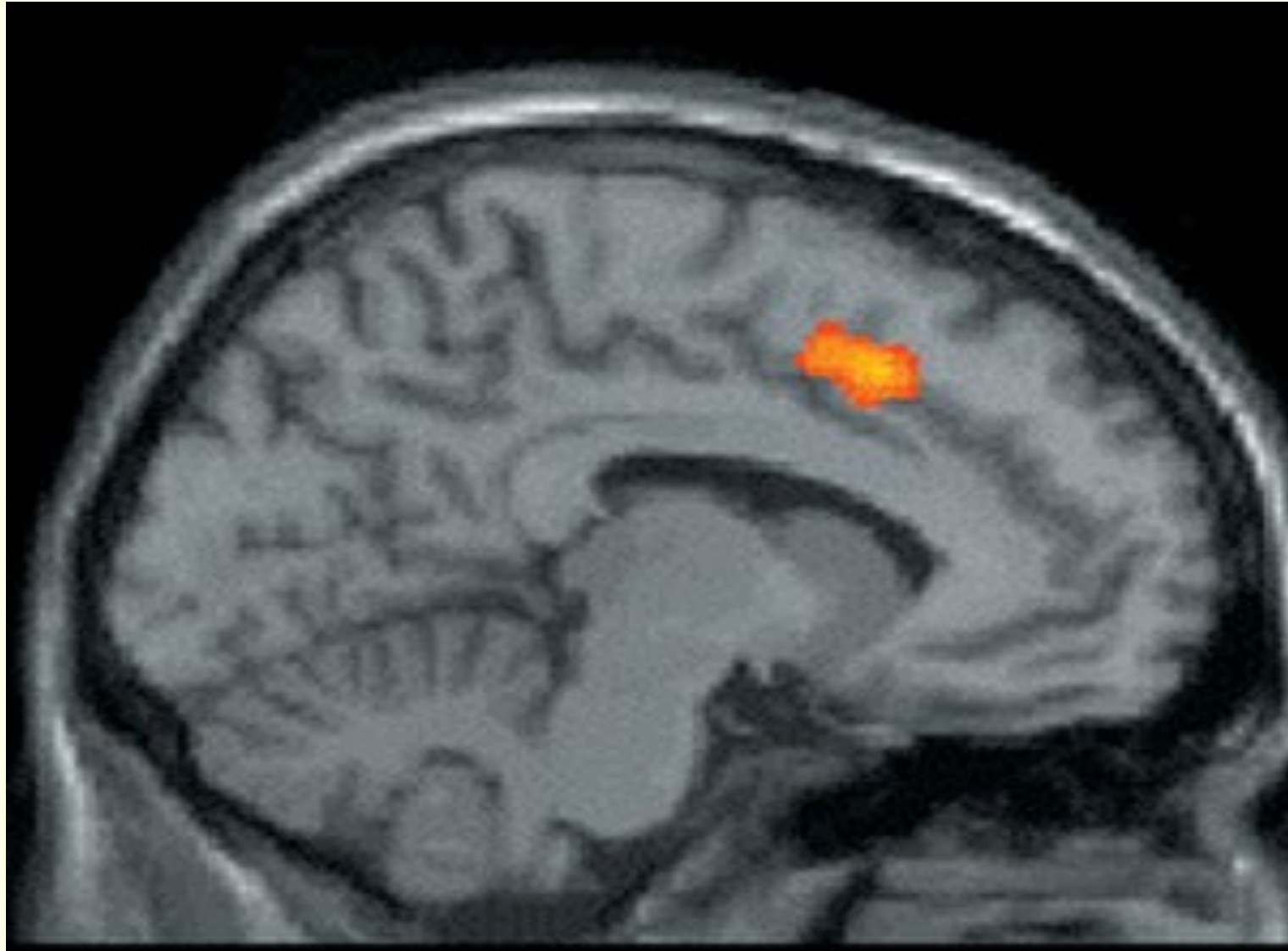
There may be more to it than this.





**Mental activity entails
underlying neural activity.**

“Ardent, Diligent, Resolute, and Mindful”



**Repeated mental activity entails
repeated neural activity.**

**Repeated neural activity
builds neural structure.**

A detailed illustration of a neural network. Numerous yellow, thread-like axons crisscross the frame, connecting various cell bodies. In the center, a single neuron is highlighted with a bright green nucleus and a glowing green cell body, making it stand out from the surrounding yellow network. The background is dark, emphasizing the luminous structure of the neurons.

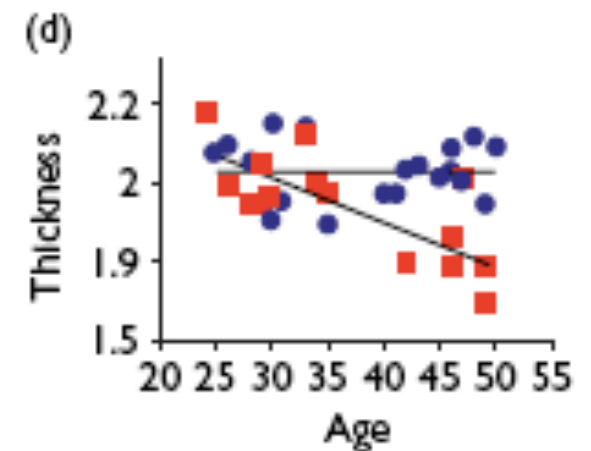
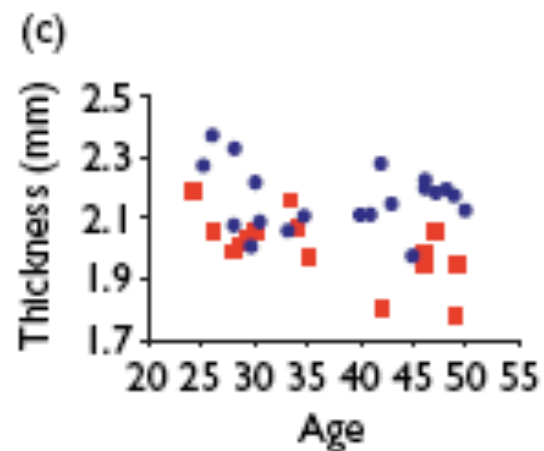
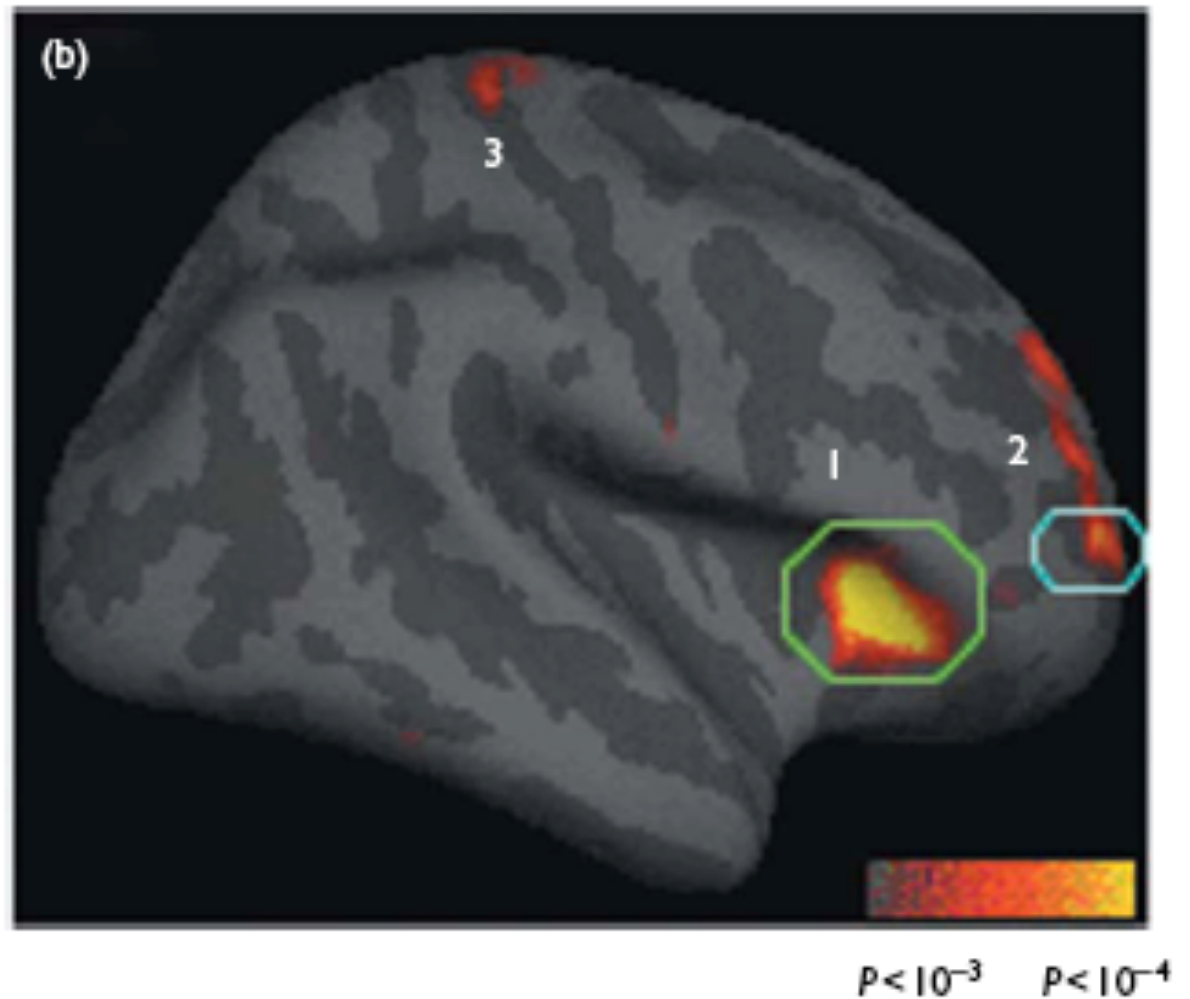
Neurons that fire together,

wire together.

Key Mechanisms of Neuroplasticity

- (De)Sensitizing existing synapses
- Building new synapses between neurons
- Altered gene expression inside neurons
- Building and integrating new neurons
- Altered activity in a region
- Altered connectivity among regions
- Changes in neurochemical activity (e.g., dopamine)
- Changes in neurotrophic factors
- Modulation by stress hormones, cytokines
- Slow wave and REM sleep
- Information transfer from hippocampus to cortex

Lazar, et al. 2005.
Meditation
experience is
associated
with increased
cortical thickness.
Neuroreport, 16,
1893-1897.



Effects of Meditation on the Brain

- Increased gray matter in the:
 - Insula – interoception; self-awareness; empathy for emotions
 - Hippocampus – visual-spatial memory; establishing context; inhibiting amygdala and cortisol
 - Prefrontal cortex (PFC) – executive functions; attention control
- Reduced cortical thinning with aging in insula and PFC
- Increased activation of left frontal regions, which lifts mood
- Increased gamma-range brainwaves – may be associated with integration, “coming to singleness,” “unitary awareness”
- Preserved telomere length


The Opportunity

We can use the mind

To change the brain

To change the mind for the better

To benefit ourselves and other beings.



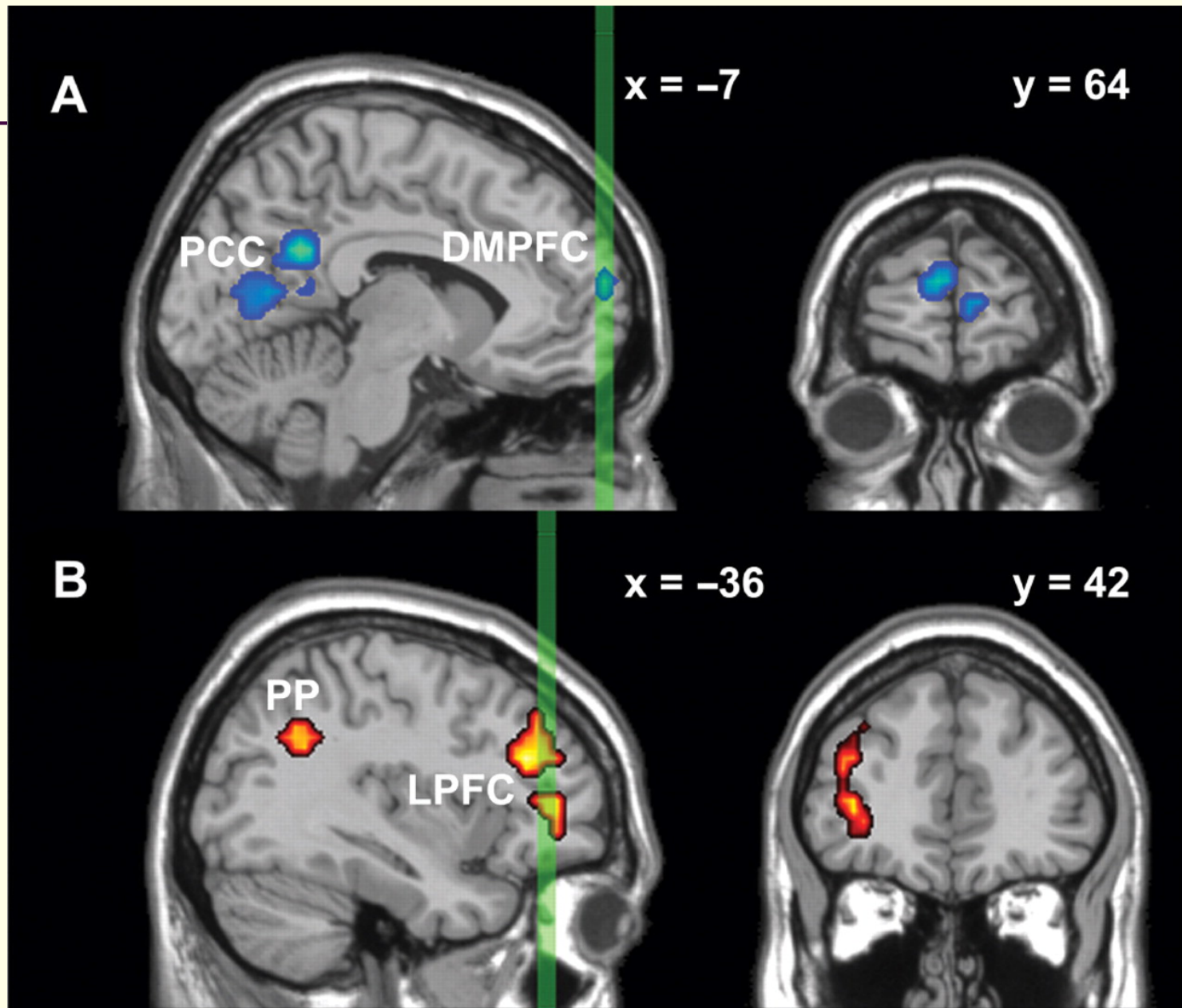
**Let's sit a bit,
letting the mind settle down,**

**and as you like
opening to a sense of compassion
and support for yourself.**



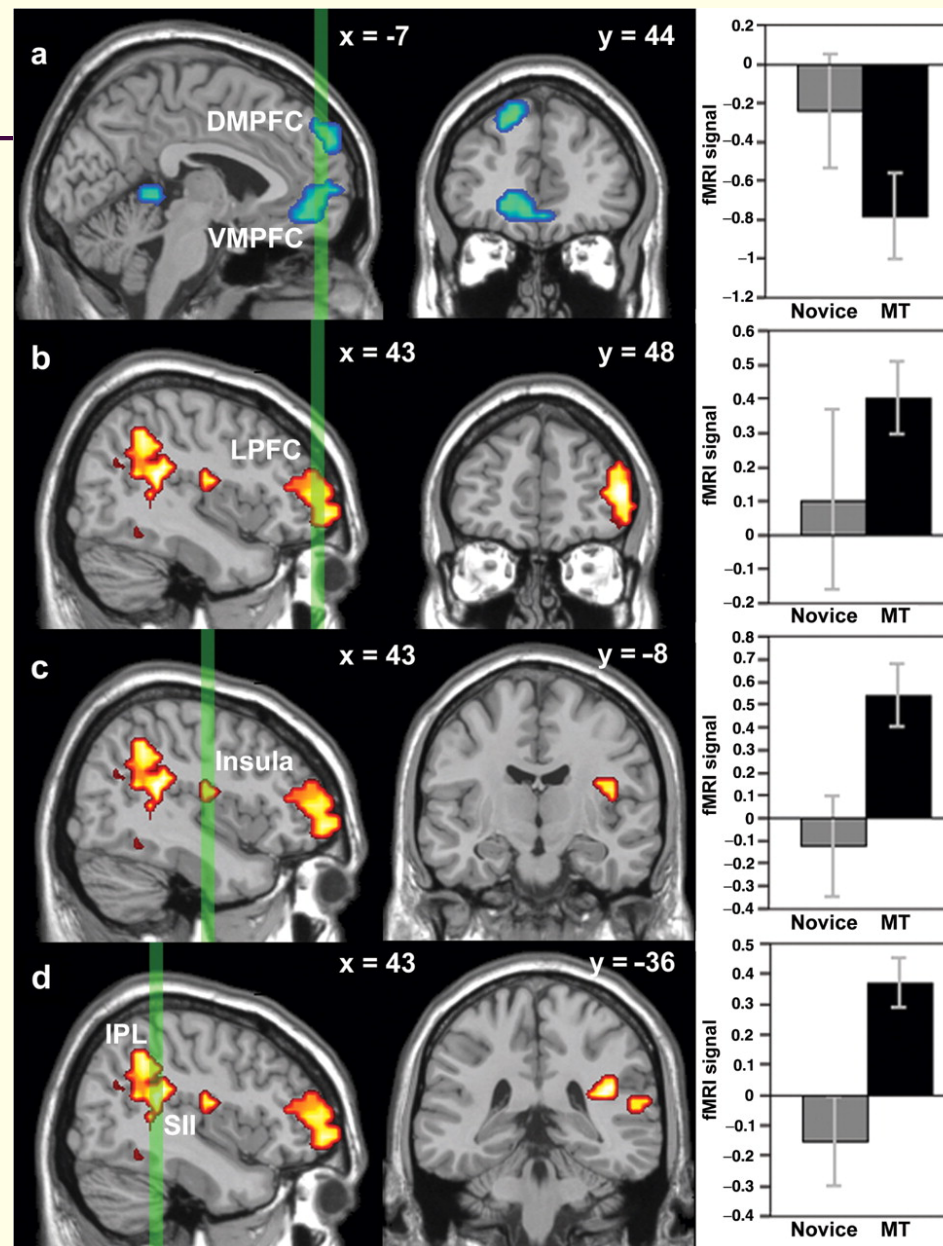
Lateral Networks of Spacious Awareness

Self-Focused (blue) and Open Awareness (red) Conditions (in the novice, pre MT group)



Farb, et al. 2007. *Social Cognitive Affective Neuroscience*, 2:313-322

Self-Focused (blue) and Open Awareness (red) Conditions (following 8 weeks of MT)



Ways to Activate Lateral Networks

- Relax.
- Focus on bare sensations and perceptions.
- Sense the body as a whole.
- Take a panoramic, “bird’s-eye” view.
- Engage “don’t-know mind”; release judgments.
- Don’t try to connect mental contents together.
- Let experience flow, staying here now.
- Relax the sense of “I, me, and mine.”

Whole Body Awareness

- Practice:
 - Sense the breath in one area (e.g., chest, upper lip)
 - Sense the breath as a whole: one gestalt, percept
 - Sense the body as a whole, a whole body breathing
 - Sense experience as a whole: sensations, sounds, thoughts . . . all arising together as one unified thing
- This sense of the whole may be present for a second or two, then crumble; open up to it again.
- Let experience flow, staying here now.



Concentration In Contemplative Practice

Right Concentration

And what, friends, is right concentration? Here, quite secluded from sensual pleasures, secluded from unwholesome states, a person enters upon and abides in the first jhana, which is accompanied by applied and sustained thought, with rapture and pleasure born of seclusion.

With the stilling of applied and sustained thought, the person enters upon and abides in the second jhana, which has self-confidence and singleness of mind without applied and sustained thought, with rapture and pleasure born of concentration.

With the fading away as well of rapture, the person abides in equanimity, and mindful and fully aware, still feeling pleasure with the body, enters upon and abides in the third jhana, on account of which noble ones announce: 'He or she has a pleasant abiding who has equanimity and is mindful.'

With the abandoning of pleasure and pain, and with the previous disappearance of joy and grief, he or she enters upon and abides in the fourth jhana, which has neither-pain-nor-pleasure and purity of mindfulness due to equanimity. This is called right concentration.

The Jhana Factors

- **Applied attention** – bringing it to bear
- **Sustained attention** – staying with the target
- **Joy** – happiness, contentment, and tranquility
- **Rapture** – great interest in the target, bliss
- **Singleness** – unification of awareness

Cultivating Vipassana

- Insight is the ultimate aim.
- Insight is nourished by stable, quiet, collected, and concentrated states . . . of the brain.
- Liberating insight - and Nibbana itself - is the fruit of virtue, wisdom, and contemplative practice.

*Even if the ripe apple falls ultimately by grace,
its ripening depended upon
the watering, feeding, protecting, and shaping of its tree.*

Penetrative insight
joined with calm abiding
utterly eradicates
afflicted states.

Shantideva

Heartwood

This spiritual life does not have gain, honor, and renown for its benefit, or the attainment of moral discipline for its benefit, or the attainment of concentration for its benefit, or knowledge and vision for its benefit.

But it is this unshakable liberation of mind that is the goal of this spiritual life, its heartwood, and its end.

The Buddha



Steady and Quiet

A Road Map from the Buddha

The Buddha described a progressive process in which:

...the mind is steadied internally, quieted, brought to singleness, and concentrated - Anguttara Nikaya 3:100 - leading to liberating insight.

- **Steadied internally** – absorption in the object of attention
- **Quieted** – tranquility, little verbal or emotional activity
- **Brought to singleness** – sense of wholeness, minimal thought, unification of awareness as a single gestalt continuously
- **Concentrated** – the jhanas or related non-ordinary states of consciousness; great absorption; powerful sense of joy, rapture, equanimity

Steadied Internally

- Pick an object of attention.
- Apply and sustain attention to it.
- Give over to it, surrender to it: “Be devoted to it and renounce all else.”
- Be aware of boredom, discontent with the moment as it is, hunger for stimulation.
- Stay alert to mind wandering and disengage quickly, returning to the object of attention.



Let's move around a bit . . .

Quieted

- “Tranquilize the body.”
- Disengage from strain, stress, striving.
- Disengage from verbal activity.
- “Tranquilize the feeling tone” – let “pleasant” and “unpleasant” settle down; be content with “neutral.”
- “Tranquilize perception” – let go of memory, conceptualizing; let yourself not know at the front edge of now.
- Rest in awareness like a still pond with few waves.

*In the deepest forms of insight,
we see that things change so quickly
that we can't hold onto anything,
and eventually the mind lets go of clinging.*

*Letting go brings equanimity.
The greater the letting go, the deeper the equanimity.
In Buddhist practice, we work to expand
the range of life experiences in which we are free.*

U Pandita



Happiness, Contentment, Tranquility

Happiness

- Recognize that happiness is skillful means. Let yourself feel happy, in a broad sense.
- Other thoughts and feelings may occur alongside happiness; that's all right.
- Bring to mind sources of gratitude and gladness; encourage happiness.
- Explore happiness about the welfare of others.
- Take happiness as your object of attention; rest in a global sense of happiness.

Contentment

- Let happiness settle into contentment: well-being with no wish for the moment to be other than it is.
- Let go of any disappointment, frustration, or striving; let any discontent fall away.
- Let there be a sense of fullness and enoughness.
- Take contentment as your object of attention; rest in a global sense of contentment.

Tranquility

- Let contentment settle into tranquility: a deep sense of ease, quiet, and peace.
- Do not follow thoughts, feelings, sensations; let them pass like the shadows of birds on a peaceful pond, leaving no trace behind.
- There may be a felt sense or intuition of a stillness underlying all mental phenomena.
- Take tranquility as your object of attention; rest in a global sense of tranquility.

*This is peaceful, this is sublime:
The calming of all mental constructions,
the letting go of all supports,
the extinguishing of craving,
dispassion,
cessation,
Nirvana.*

Majjhima Nikaya 64



Supplemental Materials

Great Books

See www.RickHanson.net for other great books.

- Austin, J. 2009. *Selfless Insight*. MIT Press.
- Begley, S. 2007. *Train Your Mind, Change Your Brain*. Ballantine.
- Carter, C. 2010. *Raising Happiness*. Ballantine.
- Hanson, R. (with R. Mendius). 2009. *Buddha's Brain: The Practical Neuroscience of Happiness, Love, and Wisdom*. New Harbinger.
- Johnson, S. 2005. *Mind Wide Open*. Scribner.
- Keltner, D. 2009. *Born to Be Good*. Norton.
- Kornfield, J. 2009. *The Wise Heart*. Bantam.
- LeDoux, J. 2003. *Synaptic Self*. Penguin.
- Linden, D. 2008. *The Accidental Mind*. Belknap.
- Sapolsky, R. 2004. *Why Zebras Don't Get Ulcers*. Holt.
- Siegel, D. 2007. *The Mindful Brain*. Norton.
- Thompson, E. 2007. *Mind in Life*. Belknap.

Key Papers - 1

See www.RickHanson.net for other scientific papers.

- Atmanspacher, H. & Graben, P. 2007. Contextual emergence of mental states from neurodynamics. *Chaos & Complexity Letters*, 2:151-168.
- Baumeister, R., Bratlavsky, E., Finkenauer, C. & Vohs, K. 2001. Bad is stronger than good. *Review of General Psychology*, 5:323-370.
- Braver, T. & Cohen, J. 2000. On the control of control: The role of dopamine in regulating prefrontal function and working memory; in *Control of Cognitive Processes: Attention and Performance XVIII*. Monsel, S. & Driver, J. (eds.). MIT Press.
- Carter, O.L., Callistemon, C., Ungerer, Y., Liu, G.B., & Pettigrew, J.D. 2005. Meditation skills of Buddhist monks yield clues to brain's regulation of attention. *Current Biology*. 15:412-413.

Key Papers - 2

- Davidson, R.J. 2004. Well-being and affective style: neural substrates and biobehavioural correlates. *Philosophical Transactions of the Royal Society*. 359:1395-1411.
- Farb, N.A.S., Segal, Z.V., Mayberg, H., Bean, J., McKeon, D., Fatima, Z., and Anderson, A.K. 2007. Attending to the present: Mindfulness meditation reveals distinct neural modes of self-reflection. *SCAN*, 2, 313-322.
- Gillihan, S.J. & Farah, M.J. 2005. Is self special? A critical review of evidence from experimental psychology and cognitive neuroscience. *Psychological Bulletin*, 131:76-97.
- Hagmann, P., Cammoun, L., Gigandet, X., Meuli, R., Honey, C.J., Wedeen, V.J., & Sporns, O. 2008. Mapping the structural core of human cerebral cortex. *PLoS Biology*. 6:1479-1493.
- Hanson, R. 2008. Seven facts about the brain that incline the mind to joy. In *Measuring the immeasurable: The scientific case for spirituality*. Sounds True.

Key Papers - 3

- Lazar, S., Kerr, C., Wasserman, R., Gray, J., Greve, D., Treadway, M., McGarvey, M., Quinn, B., Dusek, J., Benson, H., Rauch, S., Moore, C., & Fischl, B. 2005. Meditation experience is associated with increased cortical thickness. *Neuroreport*. 16:1893-1897.
- Lewis, M.D. & Todd, R.M. 2007. The self-regulating brain: Cortical-subcortical feedback and the development of intelligent action. *Cognitive Development*, 22:406-430.
- Lieberman, M.D. & Eisenberger, N.I. 2009. Pains and pleasures of social life. *Science*. 323:890-891.
- Lutz, A., Greischar, L., Rawlings, N., Ricard, M. and Davidson, R. 2004. Long-term meditators self-induce high-amplitude gamma synchrony during mental practice. *PNAS*. 101:16369-16373.
- Lutz, A., Slager, H.A., Dunne, J.D., & Davidson, R. J. 2008. Attention regulation and monitoring in meditation. *Trends in Cognitive Sciences*. 12:163-169.

Key Papers - 4

- Rozin, P. & Royzman, E.B. 2001. Negativity bias, negativity dominance, and contagion. *Personality and Social Psychology Review*, 5:296-320.
- Takahashi, H., Kato, M., Matsuura, M., Mobbs, D., Suhara, T., & Okubo, Y. 2009. When your gain is my pain and your pain is my gain: Neural correlates of envy and schadenfreude. *Science*, 323:937-939.
- Tang, Y.-Y., Ma, Y., Wang, J., Fan, Y., Feng, S., Lu, Q., Yu, Q., Sui, D., Rothbart, M.K., Fan, M., & Posner, M. 2007. Short-term meditation training improves attention and self-regulation. *PNAS*, 104:17152-17156.
- Thompson, E. & Varela F.J. 2001. Radical embodiment: Neural dynamics and consciousness. *Trends in Cognitive Sciences*, 5:418-425.
- Walsh, R. & Shapiro, S. L. 2006. The meeting of meditative disciplines and Western psychology: A mutually enriching dialogue. *American Psychologist*, 61:227-239.



Neurobhavana

Two wolves in the heart

Major Buddhist Inner Strengths

Mindfulness

Investigation

Energy

Bliss

Tranquility

Concentration

Equanimity

Compassion

Kindness

Altruistic joy

Virtue

Wisdom

View

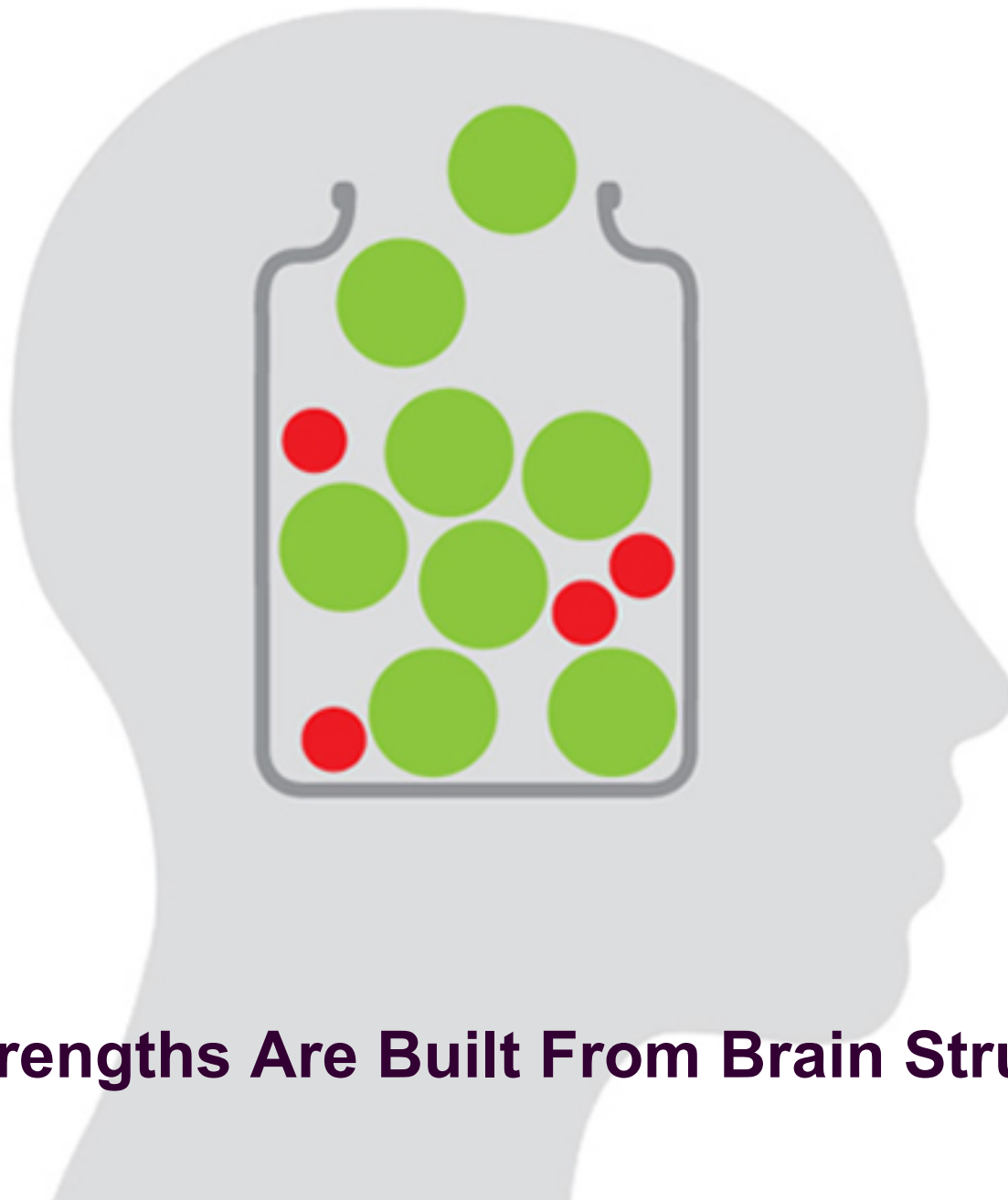
Intention

Effort

Conviction

Generosity

Patience



Inner Strengths Are Built From Brain Structure

The Activation/Installation Positive Cycle

States are temporary, traits are enduring.

Activated mental states are the basis for installed neural traits.

Positive traits foster positive states.

**Activated states --> Installed traits -->
Reactivated states --> Reinforced traits**

Cultivation in Context

- Three ways to engage the mind:
 - Be with it. Decrease negative. Increase positive.
 - The garden: Observe. Pull weeds. Plant flowers.
 - Let be. Let go. Let in.
 - Mindfulness present in all three ways to engage mind

- While “being with” is primary, it’s often isolated in mindfulness-based practices.

- Skillful means for decreasing the negative and increasing the positive have developed over 2500 years. Why not use them?



SPIRIT ROCK MEDITATION CENTER



Join us for

**Cultivating Inner Strength - Monastic
Daylong [Dana - No Fee Day]**

with Ayya Anandabodhi
and Ayya Santacitta

on

Sunday, July 8

from 9:30 am - 5 pm.

(Photo by Ed Ritger)