Self-Directed Neuroplasticity:
Using the New Brain Science
To Deepen Clinical Practice

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Topics

- Perspectives
- Brain basics
- Grounding the mind in nature
- Self-directed neuroplasticity
- The brain - so what?
- Self-compassion
Perspectives
The history of science is rich in the example of the fruitfulness of bringing two sets of techniques, two sets of ideas, developed in separate contexts for the pursuit of new truth, into touch with one another.

J. Robert Oppenheimer
Common - and Fertile - Ground

Neuroscience

Psychology

Contemplative Practice
When the facts change, 
I change my mind, sir.

What do you do?

John Maynard Keynes
We ask, “What is a thought?”

We don’t know,

yet we are thinking continually.

Venerable Tenzin Palmo
Brain Basics
A Neuron
A SYNAPSE

Axon Terminal

Presynaptic membrane neurotransmitter released by exocytosis

Mitochondrion produce ATP

Synaptic vesicles contain neurotransmitter

Synaptic Cleft

Postsynaptic membrane has receptors for neurotransmitters

Dendrite of second neuron
Your Brain: The Technical Specs

- **Size:**
  - 3 pounds of tofu-like tissue
  - 1.1 trillion brain cells
  - 100 billion “gray matter” neurons

- **Activity:**
  - Always on 24/7/365 - Instant access to information on demand
  - 20-25% of blood flow, oxygen, and glucose

- **Speed:**
  - Neurons firing around 5 to 50 times a second (or faster)
  - Signals crossing your brain in a tenth of a second

- **Connectivity:**
  - Typical neuron makes ~ 5000 connections with other neurons:
    - ~ 500 trillion synapses
Grounding the Mind in Nature
Evolution is a tinkerer. In living organisms, new capabilities are achieved by modifying existing molecules slightly and adjusting their interaction with other existing molecules.

Science has found surprisingly few proteins that are truly unique to the human brain and no signaling systems that are unique to it.

All life, including the substrate of our thoughts and memories, is composed of the same building blocks.

Eric R. Kandel
All cells have specialized functions. Brain cells have particular ways of processing information and communicating with each other. Nerve cells form complete circuits that carry and transform information.

Electrical signaling represents the language of mind, the means whereby nerve cells, the building blocks of the brain, communicate with one another over great distances. Nerve cells generate electricity as a means of producing messages.

All animals have some form of mental life that reflects the architecture of their nervous system.

Eric R. Kandel
The Mind/Brain System

"Mind" = flow of information within the nervous system:
- Information is represented by the nervous system.
- Most mind is unconscious; awareness is an aspect of mind.
- The headquarters of the nervous system is the brain.

In essence then, apart from hypothetical transcendental factors, the mind is what the brain does.

Brain = necessary, proximally sufficient condition for mind:
- The brain depends on the nervous system, other bodily systems, nature, and culture.
- As we’ll see, the brain also depends on the mind.

Therefore, the brain and mind are two aspects of one system, interdependently arising.
Self-Directed Neuroplasticity
Fact #1

As your brain changes, your mind changes.
Ways That Brain Can Change Mind

For better:
- A little caffeine: more alertness
- Thicker insula: more self-awareness, empathy
- More left prefrontal activation: more happiness

For worse:
- Intoxication; imbalances in neurotransmitters
- Concussion, stroke, tumor, Alzheimer’s
- Cortisol-based shrinkage of hippocampus: less capacity for contextual memory
Fact #2

As your mind changes, your brain changes.

Immaterial mental activity maps to material neural activity.

This produces temporary changes in your brain and lasting ones.

Temporary changes include:

- Alterations in brainwaves (= changes in the firing patterns of synchronized neurons)
- Increased or decreased use of oxygen and glucose
- Ebbs and flows of neurochemicals
Rewards of Love
Pain network: Dorsal anterior cingulate cortex (dACC), insula (Ins), somatosensory cortex (SSC), thalamus (Thal), and periaqueductal gray (PAG). Reward network: Ventral tegmental area (VTA), ventral striatum (VS), ventromedial prefrontal cortex (VMPFC), and amygdala (Amyg). K. Sutliff, in Lieberman & Eisenberger, 2009, Science, 323:890-891
Tibetan Monk, Boundless Compassion
Christian Nuns, Recalling a Profound Spiritual Experience

Beauregard, et al., *Neuroscience Letters*, 9/25/06
Mind Changes Brain in Lasting Ways

- What flows through the mind sculpts your brain. Immaterial experience leaves material traces behind.

- Increased blood/nutrient flow to active regions

- Altered epigenetics (gene expression)

- “Neurons that fire together wire together.”
  - Increasing excitability of active neurons
  - Strengthening existing synapses
  - Building new synapses; thickening cortex
  - Neuronal “pruning” - “use it or lose it”
Honoring Experience

One’s experience *matters*. Both for how it feels in the moment and for the lasting residues it leaves behind, woven into the fabric of a person’s brain and being.
Fact #3

You can use your mind
to change your brain
to change your mind for the better.

This is self-directed neuroplasticity.

*How to do this, in skillful ways?*
The Brain: So What?
Neuroplasticity in Context

- Neuroplasticity is not breaking news. It’s been long presumed that mental activity changed neural structure: what else is learning?

- The news is in **how** the mind changes the brain.

- Most neuroplasticity is incremental, not dramatic.

- Neuroplasticity is ethically neutral.
Grounding in the Brain - Benefits

- **Organizing framework**
  - Evolutionary neuropsychology
  - Common ground across theories and methods

- **Motivating to clients, clinicians, policy-makers**
  - Concrete, in the body, *physical*
  - Status of medicine, hard science

- **Highlighting key principles and practices**
  - Implicit memory
  - Nonverbal processes

- **Innovating with truly new methods**
  - Neurofeedback
  - Fear extinction
Grounding in the Brain - Pitfalls

- **Adding little new meaning**
  - Replacing psych terms with neuro (“amygdala made me do it”)

- **Over-simplifying**
  - Over-localizing function (e.g., empathy = mirror neurons)
  - Over-emphasizing one factor (e.g., attachment experiences)
  - Exaggerated terms (“God-gene,” “female brain”)
  - Materialistic reductionism, though brain and mind co-arise

- **Claiming authority**
  - Using neuro data to argue a political or cultural case
  - Using the secular religion of science to elevate status

- **Underestimating the mind**
  - Most big changes in psyche involve tiny changes in soma; mental plasticity holds more promise than neural plasticity.
  - Overlooking the insights and effectiveness of psychology
  - Ducking existential choices in values
Self-Compassion
Self-Goodwill

- All the great teachers have told us to be compassionate and kind toward all beings. And that whatever we do to the world affects us, and whatever we do to ourselves affects the world.

- You are one of the “all beings!” And kindness to yourself benefits the world, while hurting yourself harms the world.

- It’s a general moral principle that the more power you have over someone, the greater your duty is to use that power wisely. Well, who is the one person in the world you have the greatest power over? It’s your future self. You hold that life in your hands, and what it will be depends on how you care for it.

- Consider yourself as an innocent child, as deserving of care and happiness as any other.
The good life, as I conceive it, is a happy life.  
I do not mean that if you are good you will be happy;  
I mean that if you are happy you will be good.

Bertrand Russell
If one going down into a river, swollen and swiftly flowing, is carried away by the current -- how can one help others across?

The Buddha
Feeling Cared About

As we evolved, we increasingly turned to and relied on others to feel safer and less threatened.
- Exile from the band was a death sentence in the Serengeti.
- Attachment: relying on the secure base
- The well-documented power of social support to buffer stress and aid recovery from painful experiences

Methods:
- Recognize it’s kind to others to feel cared about yourself.
- Look for occasions to feel cared about and take them in.
- Deliberately bring to mind the experience of being cared about in challenging situations.
- Be caring yourself.
Self-Compassion

- Compassion is the wish that a being not suffer, combined with sympathetic concern. Self-compassion simply applies that to oneself. It is not self-pity, complaining, or wallowing in pain.

- Studies show that self-compassion buffers stress and increases resilience and self-worth.

- But self-compassion is hard for many people, due to feelings of unworthiness, self-criticism, or "internalized oppression." To encourage the neural substrates of self-compassion:
  - Get the sense of being cared about by someone else.
  - Bring to mind someone you naturally feel compassion for.
  - Sink into the experience of compassion in your body.
  - Then shift the compassion to yourself, perhaps with phrases like: “May I not suffer. May the pain of this moment pass.”
“Anthem”

Ring the bells that still can ring
Forget your perfect offering
There is a crack in everything
That’s how the light gets in
That’s how the light gets in

Leonard Cohen
Penetrative insight

joined with calm abiding

utterly eradicates

afflicted states.

Shantideva
Great Books

See www.RickHanson.net for other great books.

Key Papers - 1

See www.RickHanson.net for other scientific papers.


Key Papers - 2


- 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


Key Papers - 4


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