

Positive Neuroplasticity: The Mindful Cultivation Of Resilient Well-Being

Google, 9.11.18



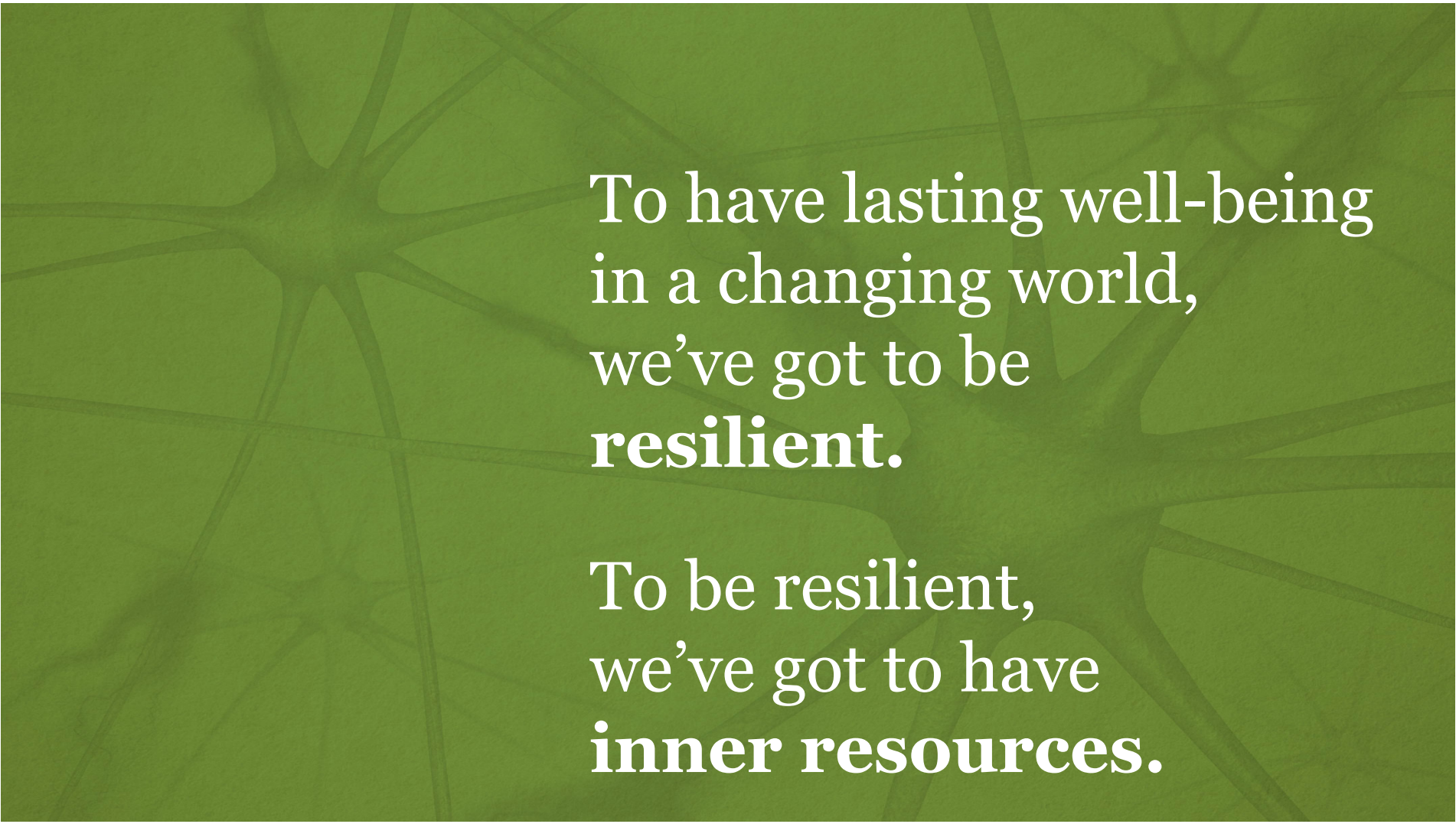
Rick Hanson, Ph.D.

Greater Good Science Center, UC Berkeley

www.RickHanson.net



The Value of
Inner Resources



To have lasting well-being
in a changing world,
we've got to be
resilient.

To be resilient,
we've got to have
inner resources.

Shaping the Course of a Life

Challenges

Vulnerabilities

Resources

Location of Resources

World

Body

Mind

Some Inner Resources

Mindfulness

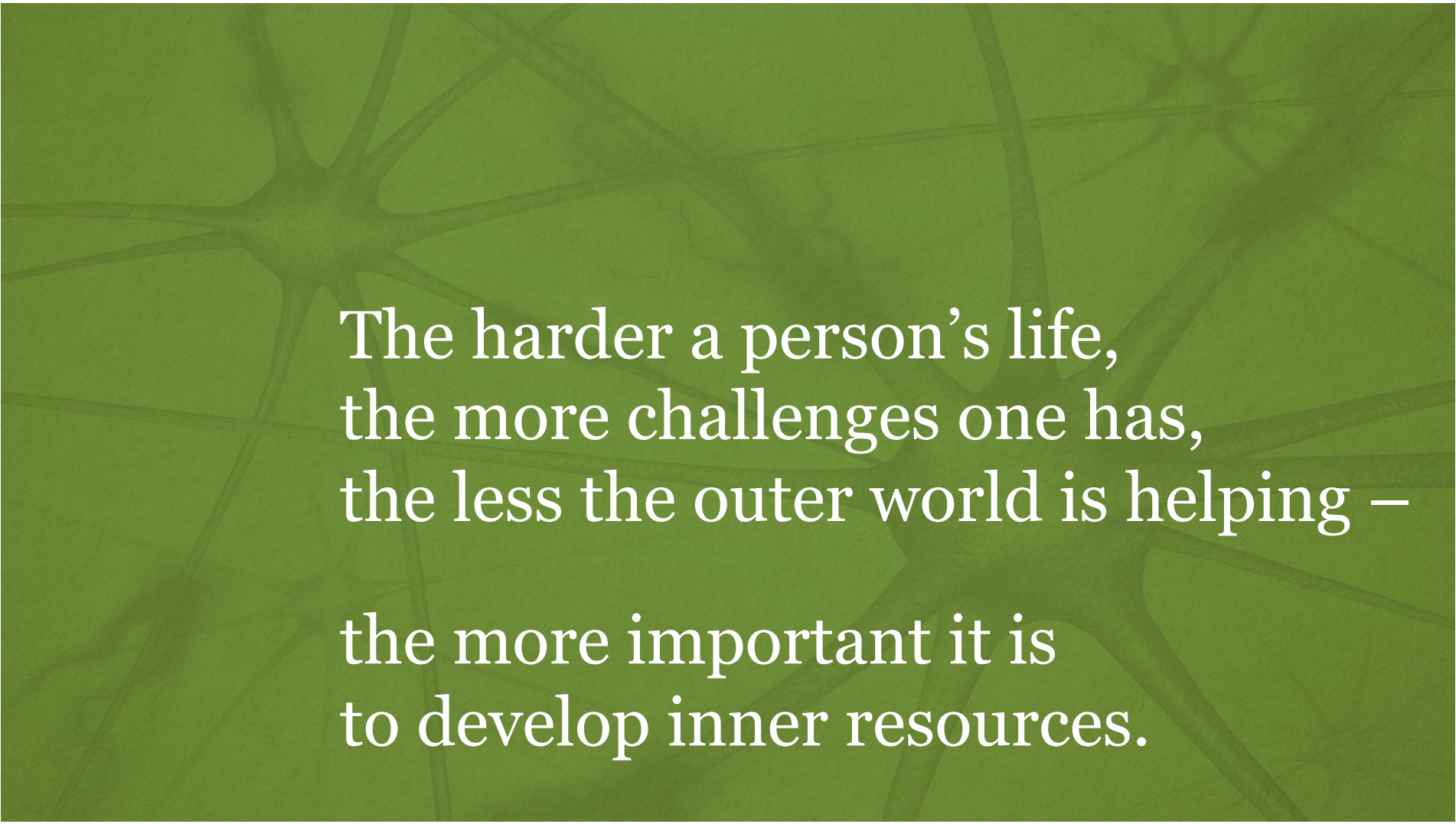
Patience, Determination, Grit

Emotional Intelligence

Character Virtues

Positive Emotions

Interpersonal Skills



The harder a person's life,
the more challenges one has,
the less the outer world is helping –
the more important it is
to develop inner resources.

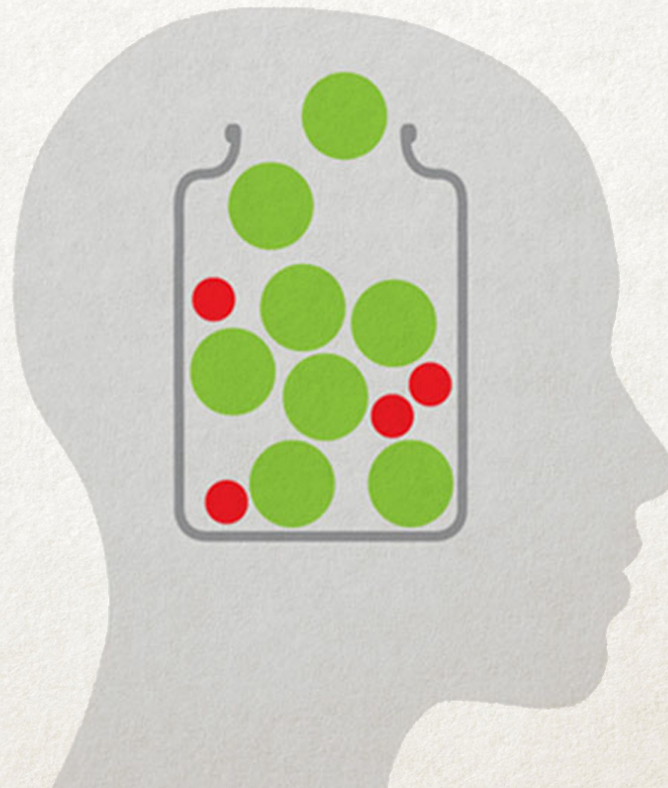
Researchers have focused on identifying and using resources – such as workplace mindfulness – but what about developing them in the first place?

The majority
of our inner resources
are acquired,

through emotional, somatic,
social, and motivational
learning –

which is fundamentally hopeful.

And Which Means Changing the Brain For the Better





Self-Directed Neuroplasticity

An Overview of Current Research

Enormous research on people that (1) mental states and traits have neural correlates and (2) mental practices change states and traits

Enormous research on non-human animals that various stimuli (with related presumed mental states) change their brains

Much research on people that mental training changes their brains

Some unintegrated research on deliberate mental factors that increase gains from therapy and psycho-social programs

Two studies on training the systematic use of such mental factors

Mental resources are acquired
in two stages:

Encoding



Consolidation

Activation



Installation

State



Trait



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

We become more **compassionate** by repeatedly installing experiences of compassion.

We become more **grateful** by repeatedly installing experiences of gratitude.

We become more **mindful** by repeatedly installing experiences of mindfulness.

BUT: Experiencing doesn't equal learning.

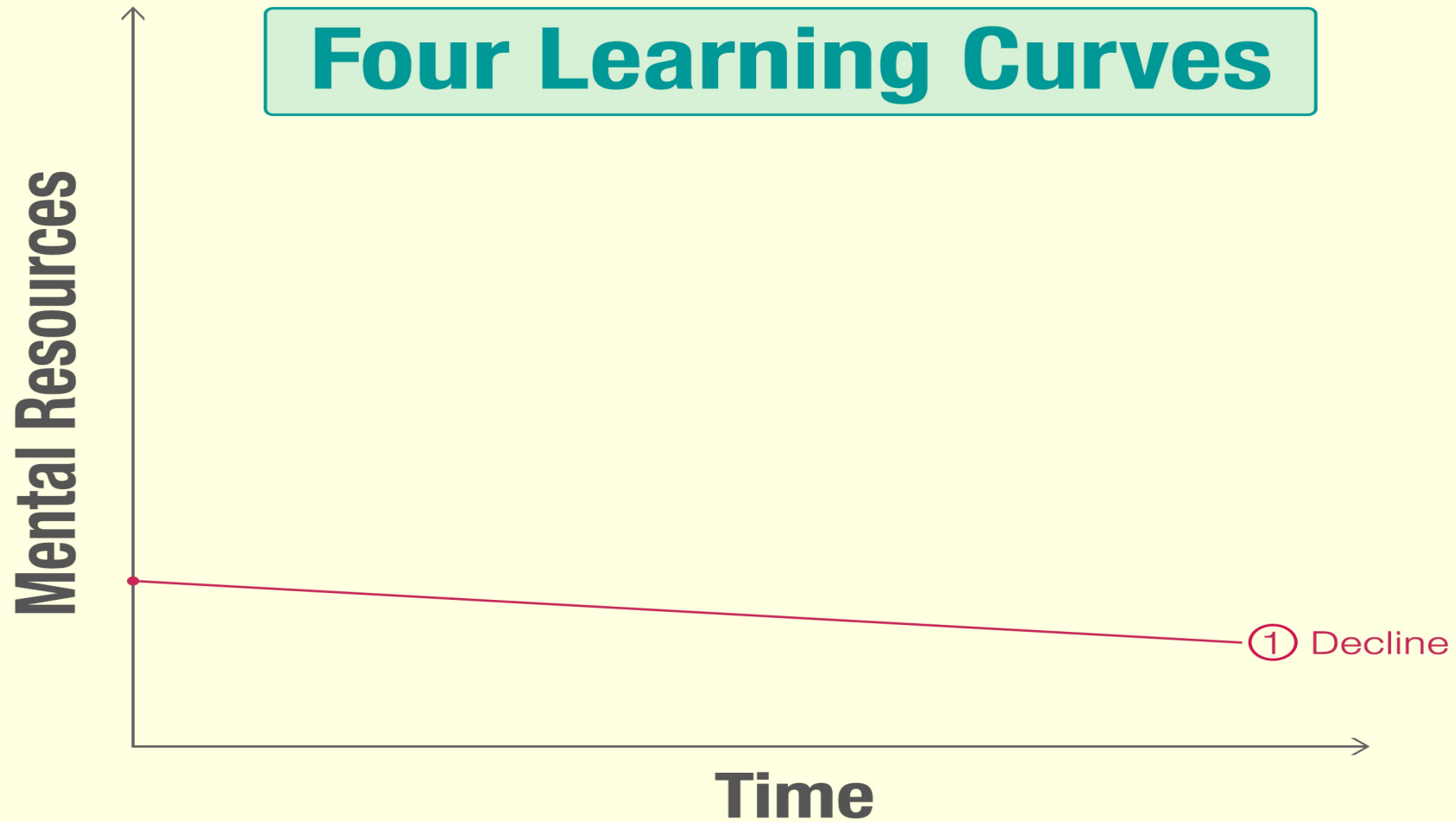
Activation **without installation
may be pleasant,
but no trait resources are acquired.**

What fraction of our
beneficial mental states lead to lasting
changes in neural structure or function?

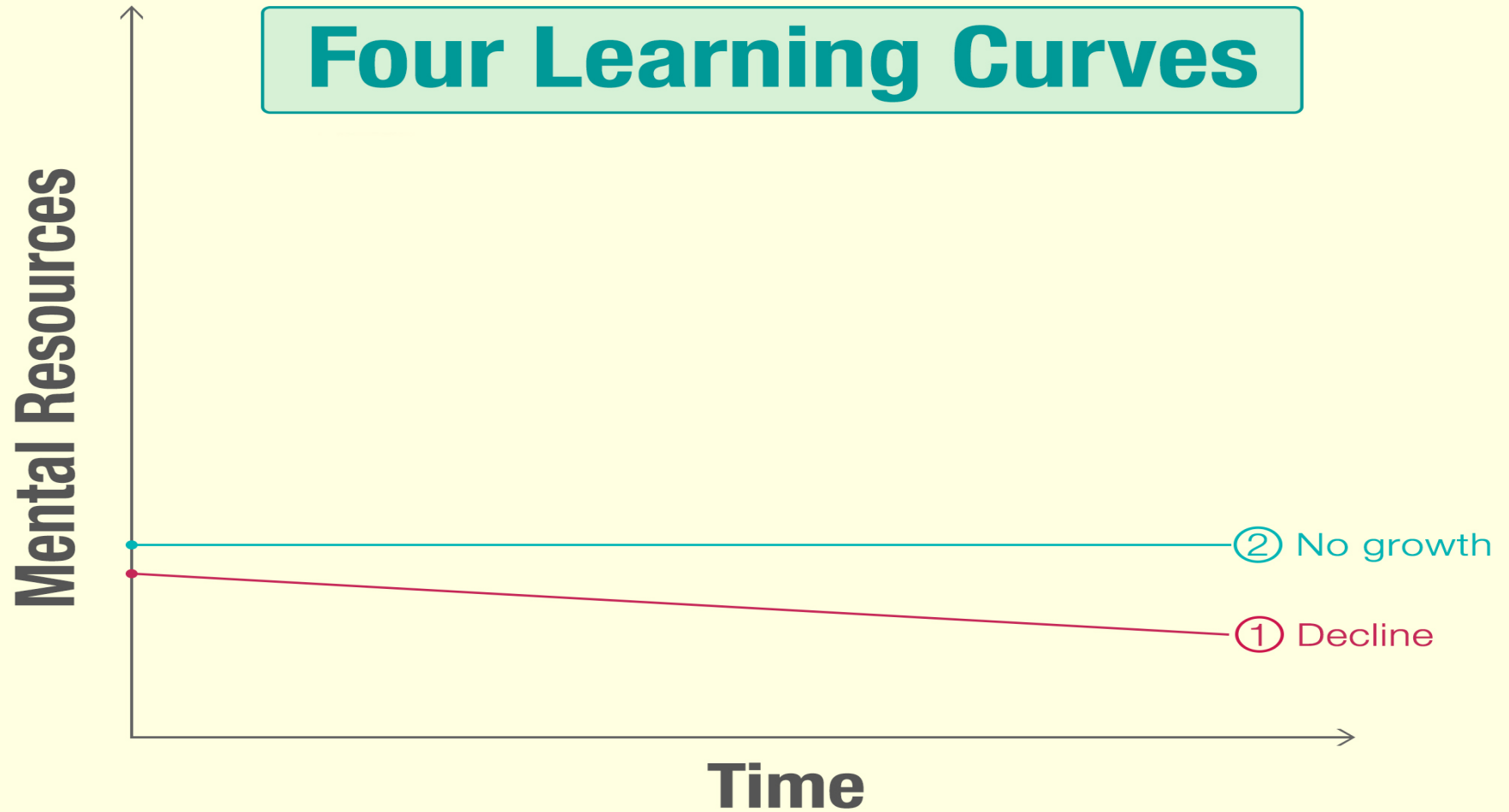
People focus more on activation than on installation.

This reduces the gains from mindfulness programs, human resources training, coaching, psychotherapy, and self-help activities.

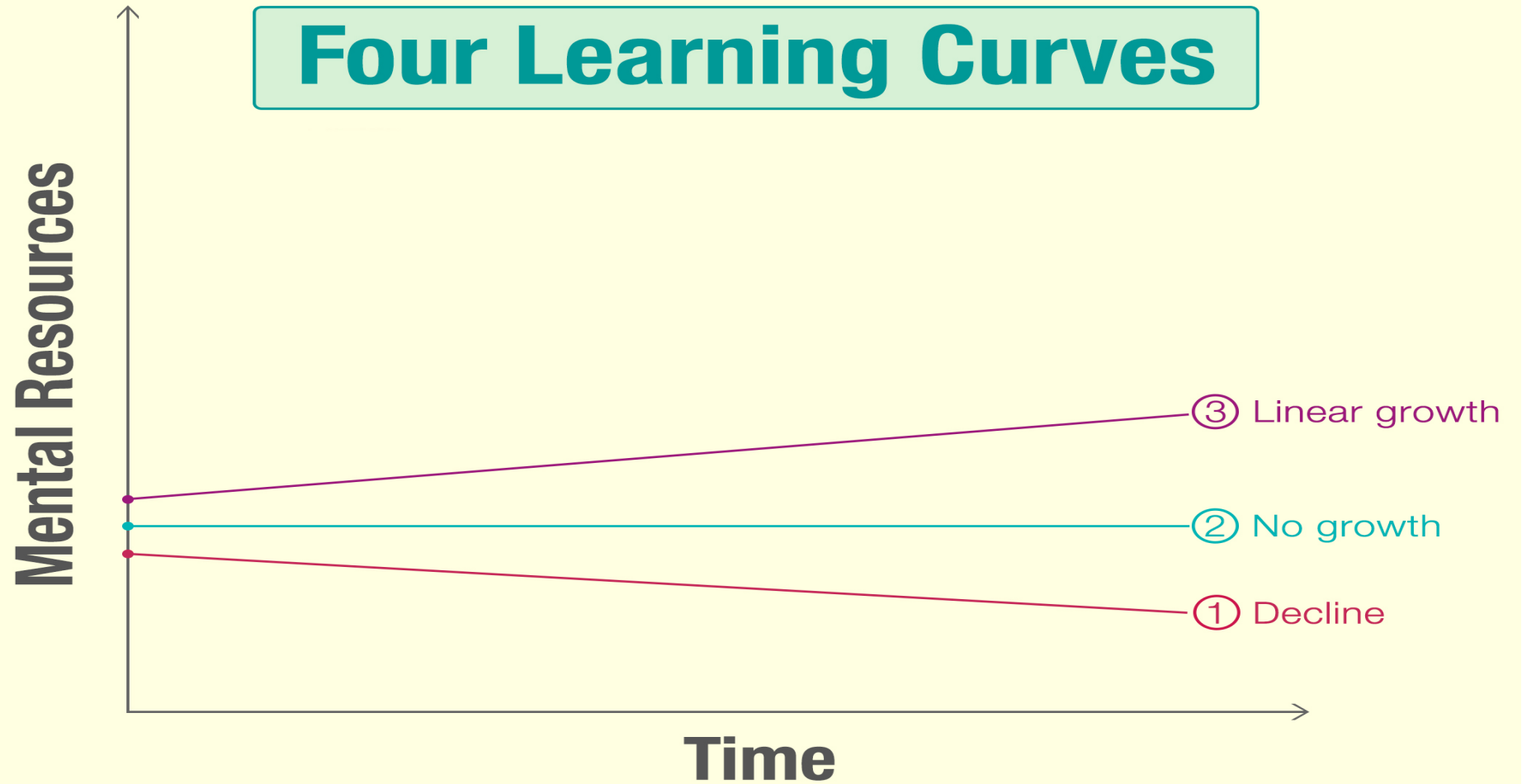
Four Learning Curves



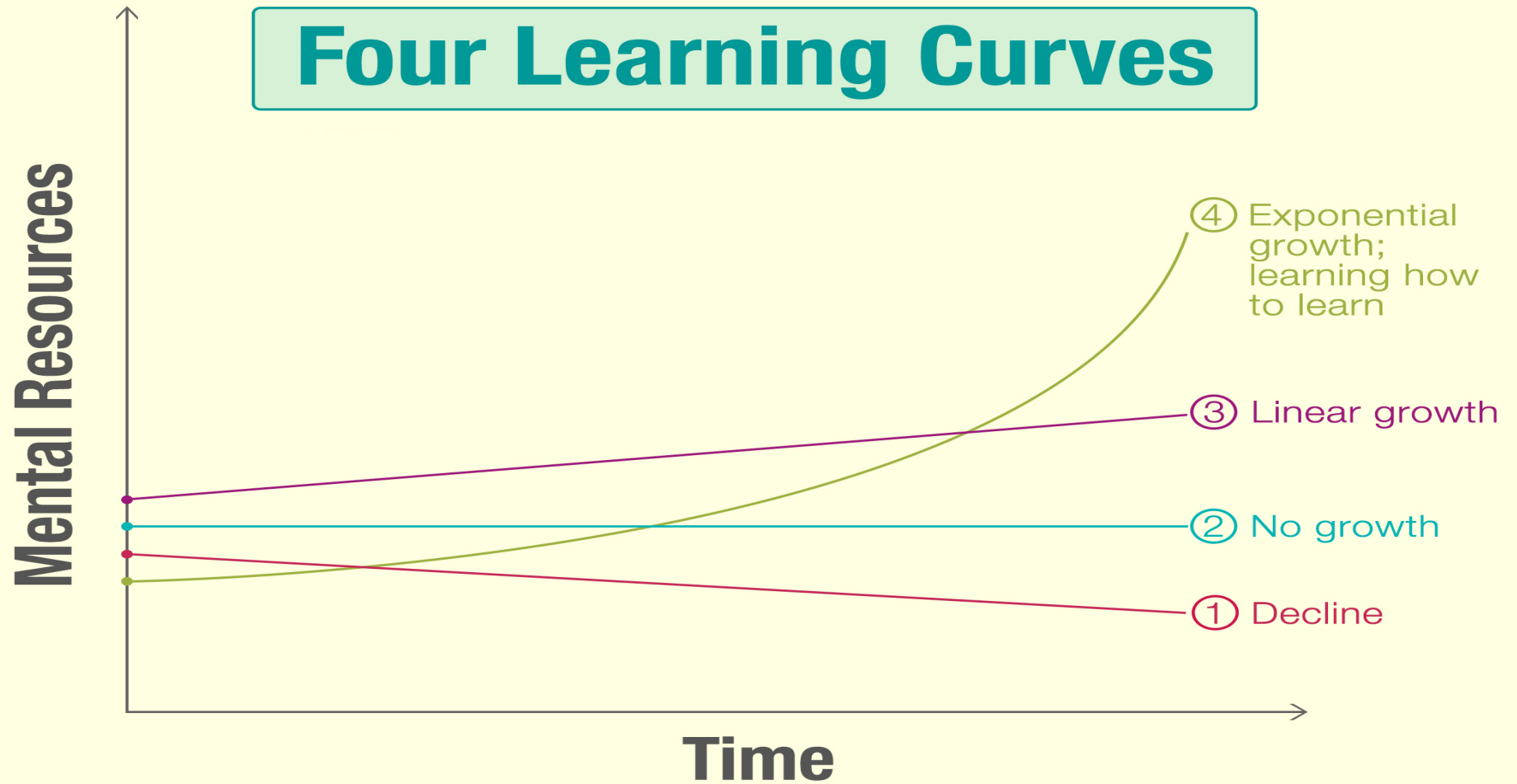
Four Learning Curves



Four Learning Curves



Four Learning Curves





What can you do
to steepen
your growth curve?

Learning
is the strength of strengths,
since it's the one we use
to grow the rest of them.

Knowing how to learn
the things that are important to you
could be the greatest strength of all.

The Negativity Bias

Velcro for Bad, Teflon for Good

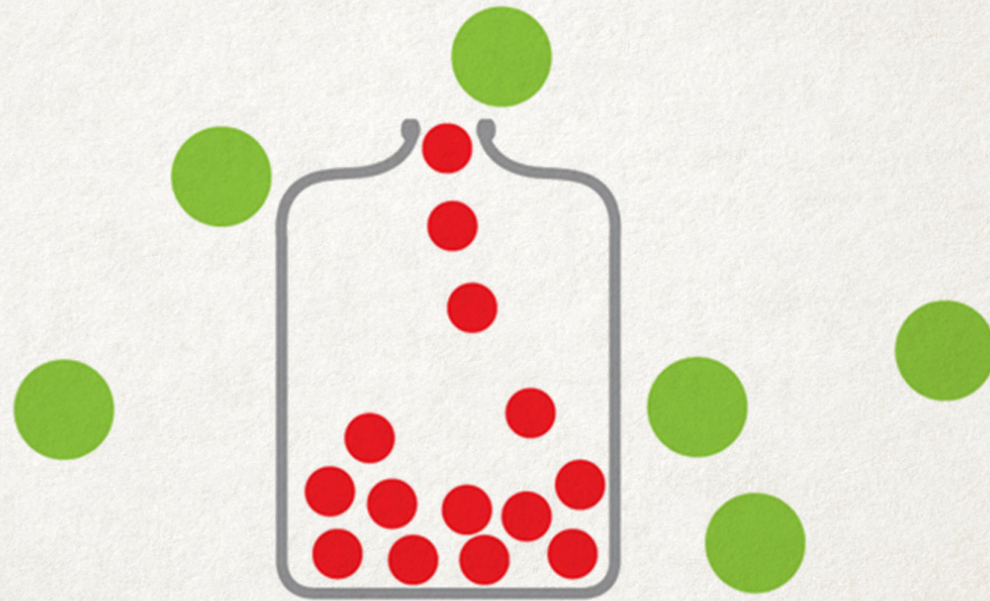


The negativity bias

The Negativity Bias

As the nervous system evolved, **avoiding “sticks”** was usually more consequential than getting “carrots.”

1. So we scan for bad news,
2. Over-focus on it,
3. Over-react to it,
4. Turn it quickly into (implicit) memory,
5. Sensitize the brain to the negative, and
6. Get into vicious cycles with others.



The Negativity Bias



—
Lasting Gains from
Passing Experiences
—

How can we increase
the conversion rate
of beneficial states
to beneficial traits?

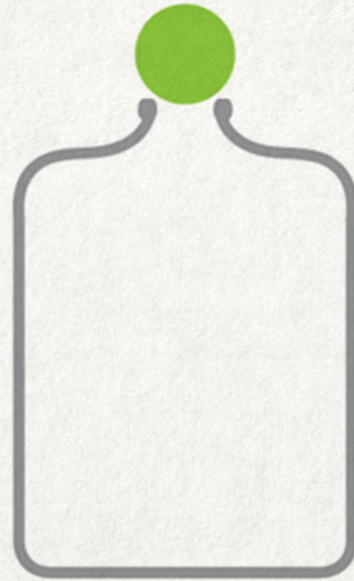
HEAL: Turning States into Traits

Activation

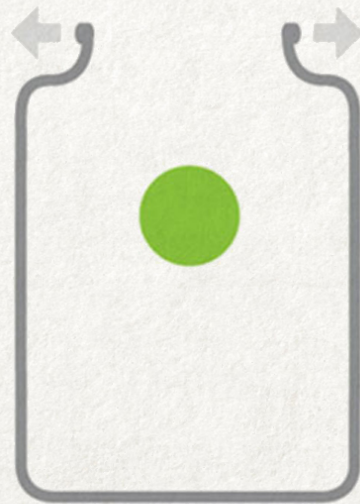
1. **H****a****v****e** a beneficial experience

Installation

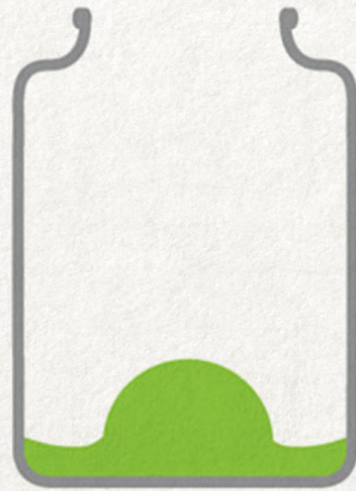
2. **E****n****r****i****c****h** the experience
3. **A****b****s****o****r****b** the experience
4. **L****i****n****k** positive and negative material
(Optional)



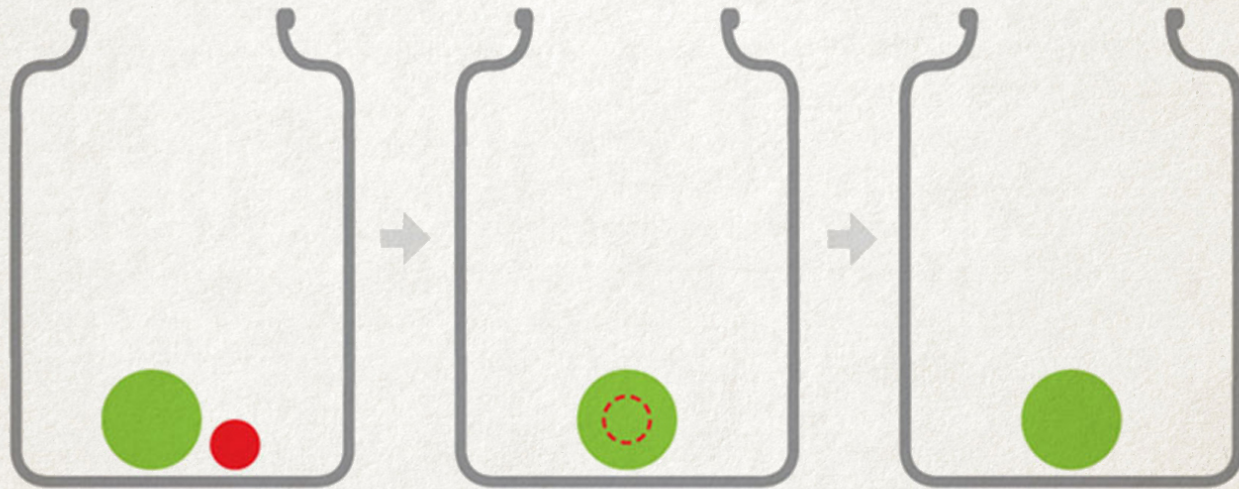
Have a Beneficial Experience



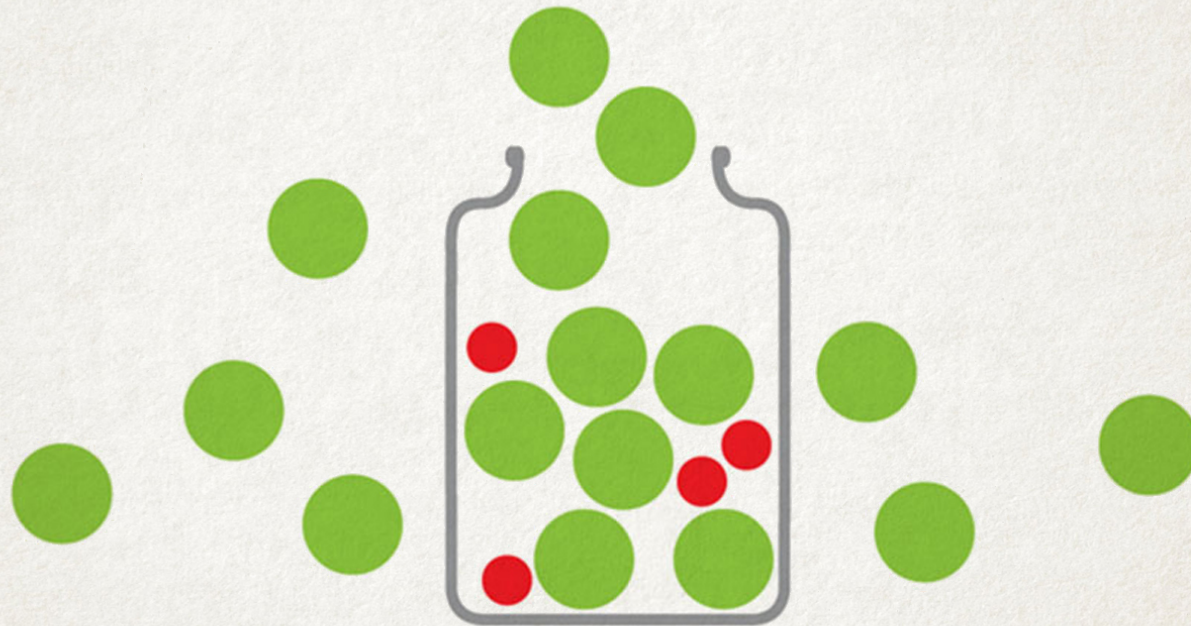
Enrich It



Absorb It



Link Positive & Negative Material



Have It, Enjoy It

Let's Try It

Notice

Relaxing as
you exhale

Create

Gratitude,
gladness

Create

Warm feelings
for someone

For each of these:

Have the experience. Enrich it. Absorb it.

It's Good to Take in the Good

Develops psychological resources:

- General – resilience, positive mood, feeling loved, etc.
- Specific – matched to challenges, wounds, deficits

Has built-in, implicit benefits:

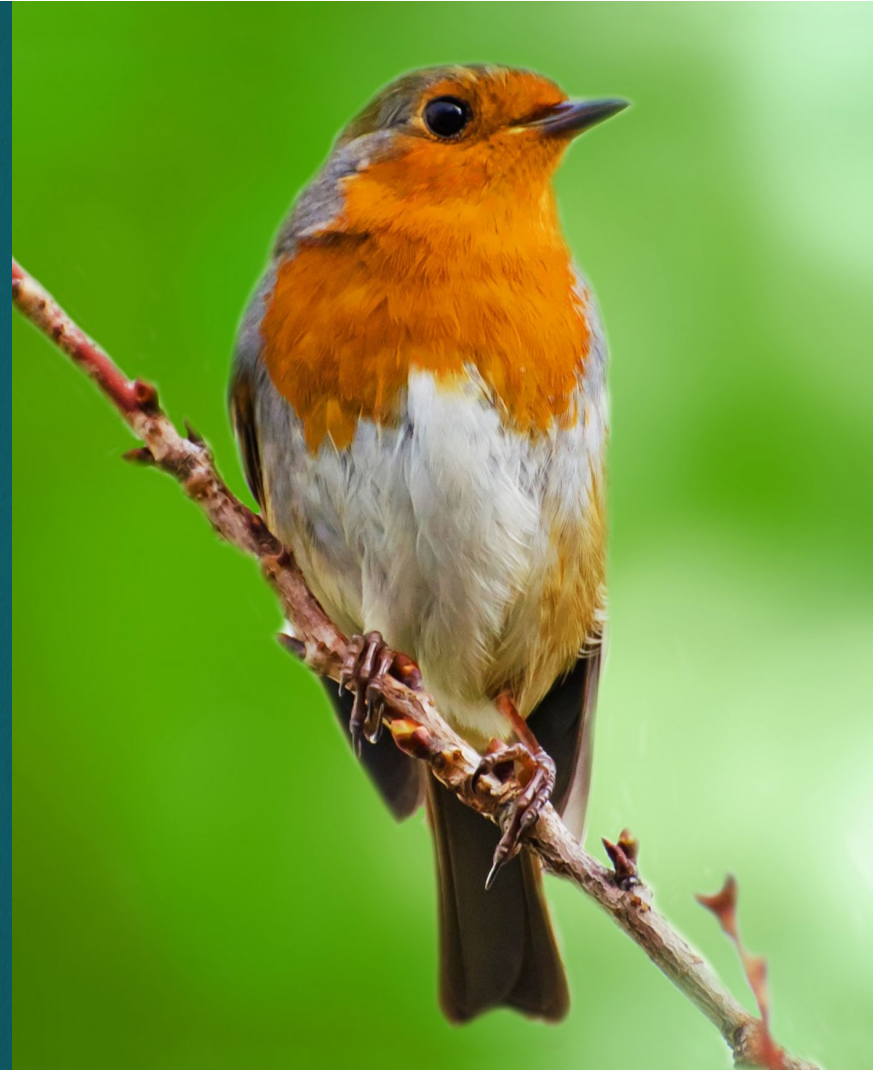
- Training attention and executive functions
- Treating oneself kindly, that one matters

May sensitize the brain to the positive

Fuels positive cycles with others

*Keep a green bough
in your heart,
and a singing bird
will come.*

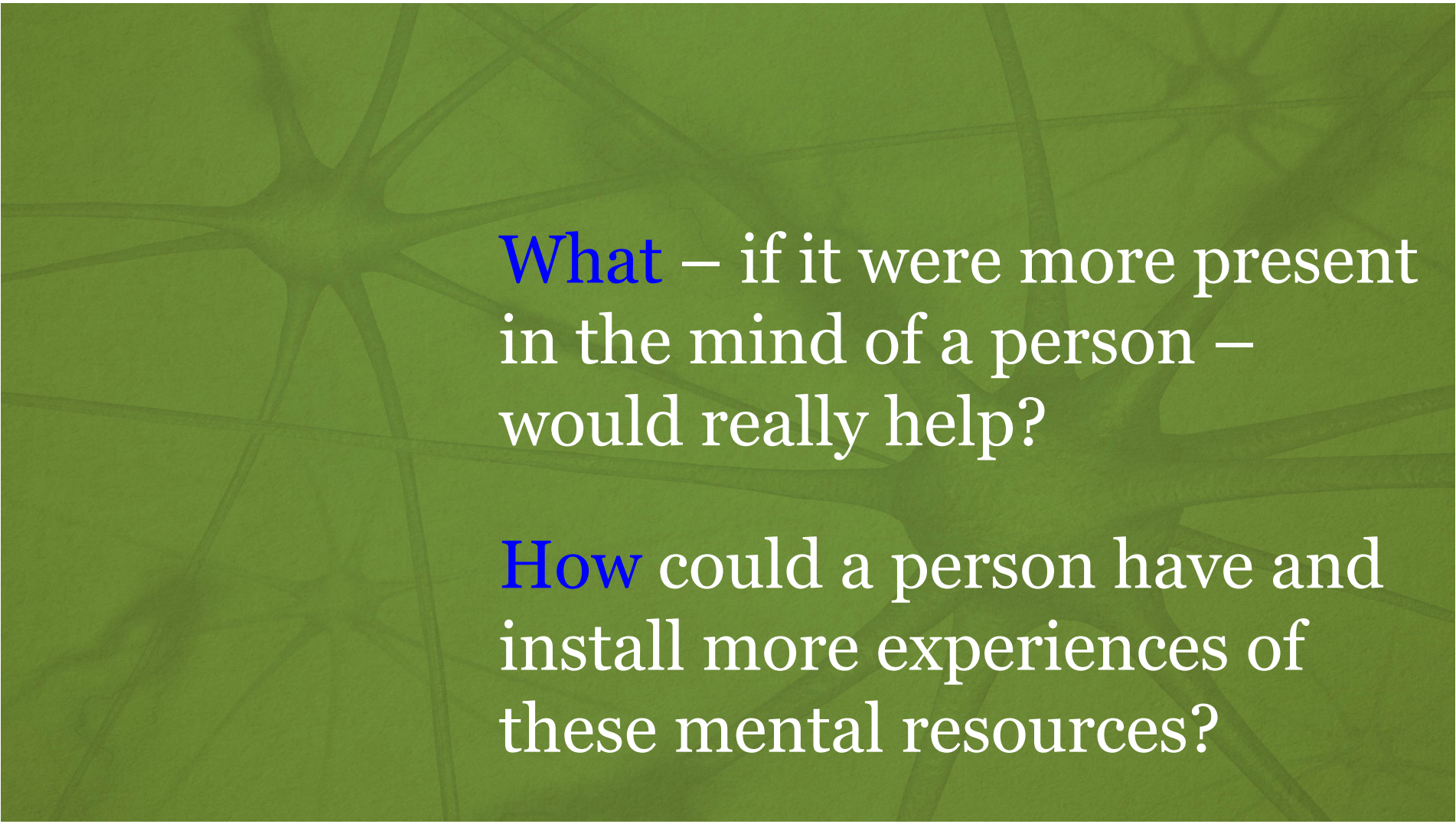
Lao Tzu



Growing Key Resources

Resilience is required
for challenges to our needs.

Understanding the need
that is challenged
helps us identify, grow, and use
the specific mental resource(s)
that are best matched to it.



What – if it were more present
in the mind of a person –
would really help?

How could a person have and
install more experiences of
these mental resources?

Meeting Our Three Fundamental Needs



Safety

Avoiding
harms

(threat response)



Satisfaction

Approaching
rewards

(goal pursuit)

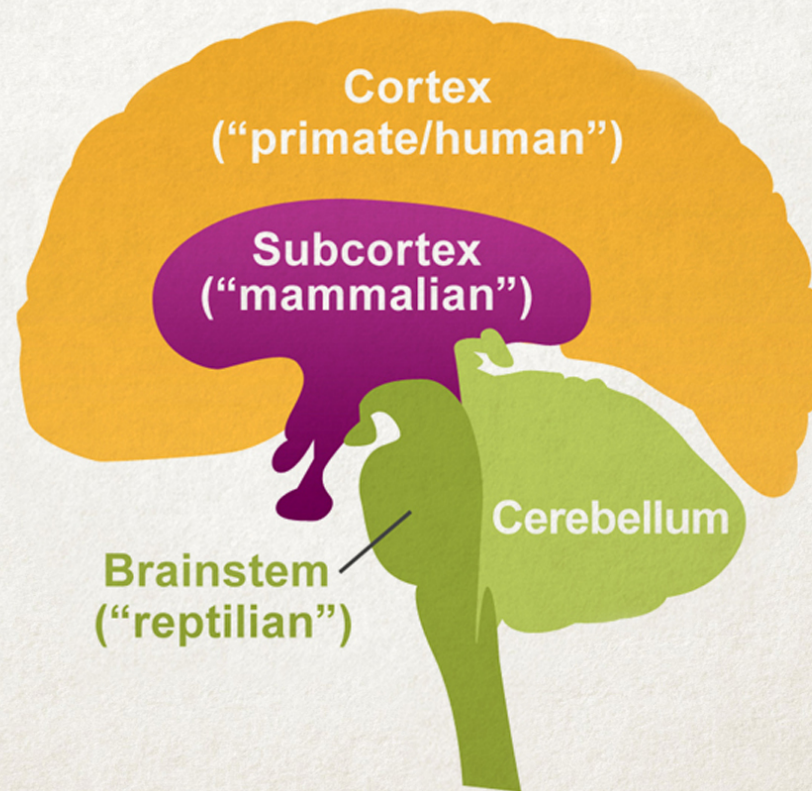


Connection

Attaching
to others

(social engagement)

The Evolving Brain



Matching Resources to Needs

Safety

See actual threats
See resources
Grit, fortitude
Feel protected
Alright right now
Relaxation
Calm

Peace

Satisfaction

Gratitude
Gladness
Feel successful
Healthy pleasures
Impulse control
Aspiration
Enthusiasm

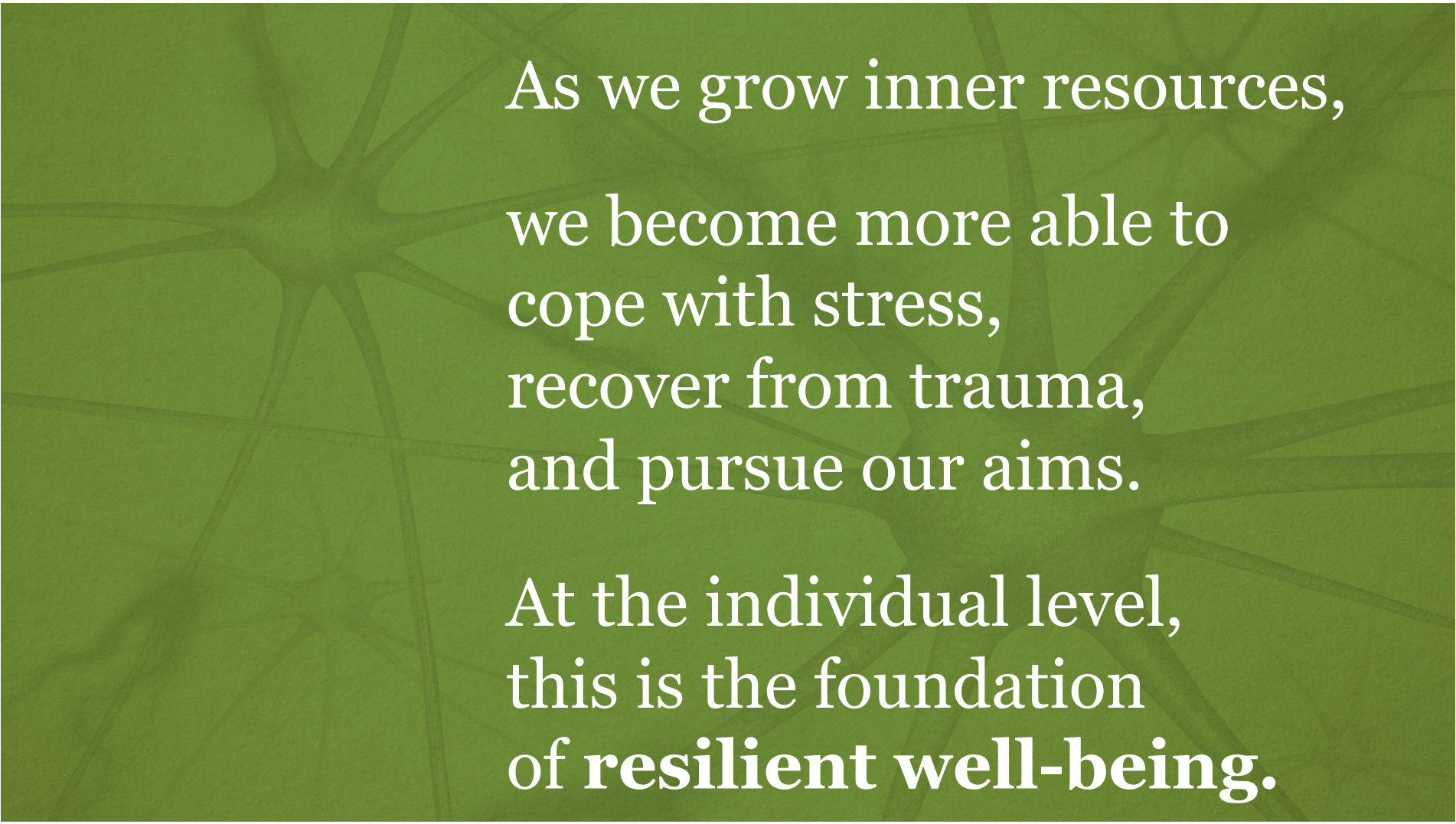
Contentment

Connection

Empathy
Compassion
Kindness
Wide circle of “us”
Assertiveness
Self-worth
Confidence

Love

Wider Implications



As we grow inner resources,
we become more able to
cope with stress,
recover from trauma,
and pursue our aims.

At the individual level,
this is the foundation
of **resilient well-being.**

At the level of groups and countries,
people become less vulnerable
to the classic manipulations of
fear and anger,
greed and possessiveness,
and “us” against “them” conflicts.

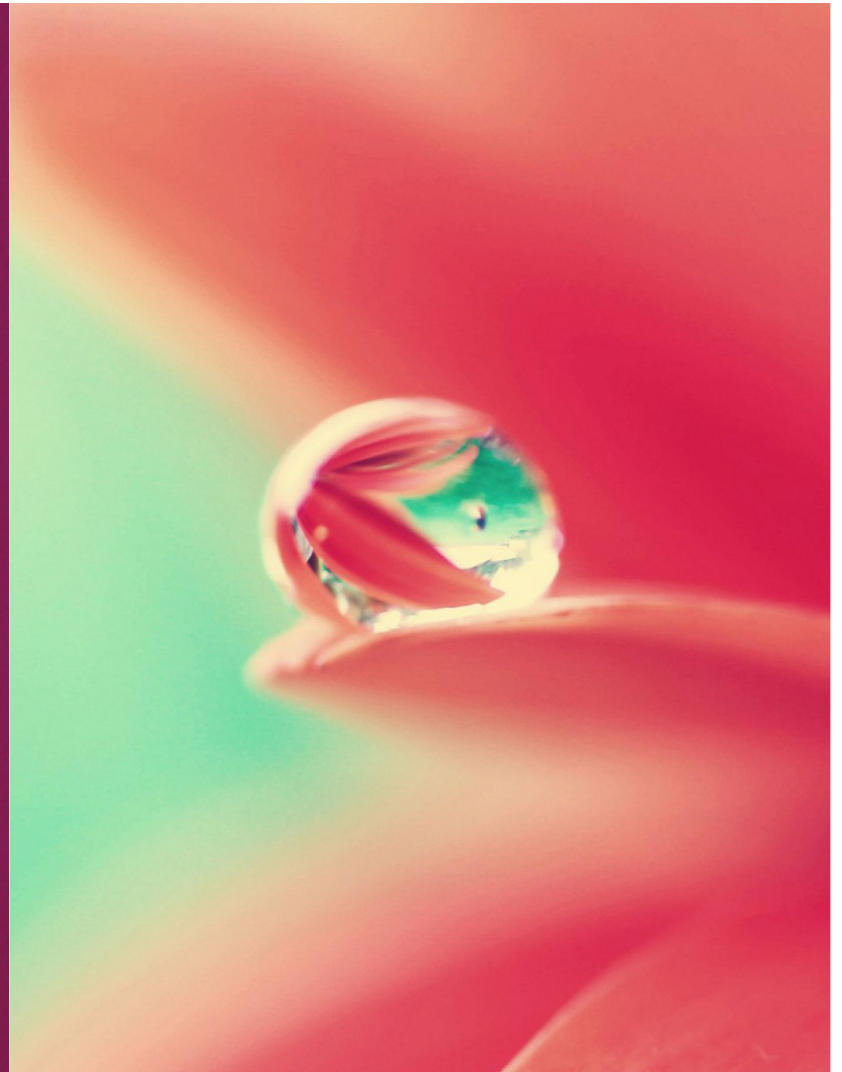
Which has big implications for our world.

*Think not lightly of good,
saying, "It will not come to me."*

*Drop by drop is
the water pot filled.*

*Likewise, the wise one,
Gathering it little by little,
Fills oneself with good.*

Dhammapada 9.122



References

Suggested Books

See **RickHanson.net** for other good 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.

Suggested References - 1

See www.RickHanson.net/key-papers/ for other suggested readings.

- Atmanspacher, H. & Graben, P. (2007). Contextual emergence of mental states from neurodynamics. *Chaos & Complexity Letters*, 2, 151-168.
- Bailey, C. H., Bartsch, D., & Kandel, E. R. (1996). Toward a molecular definition of long-term memory storage. *PNAS*, 93(24), 13445-13452.
- Baumeister, R., Bratlavsky, E., Finkenauer, C. & Vohs, K. (2001). Bad is stronger than good. *Review of General Psychology*, 5, 323-370.
- Bryant, F. B., & Veroff, J. (2007). *Savoring: A new model of positive experience*. Mahwah, NJ: Erlbaum.
- Casasanto, D., & Dijkstra, K. (2010). Motor action and emotional memory. *Cognition*, 115, 179-185.
- Claxton, G. (2002). Education for the learning age: A sociocultural approach to learning to learn. *Learning for life in the 21st century*, 21-33.
- Clopath, C. (2012). Synaptic consolidation: an approach to long-term learning. *Cognitive Neurodynamics*, 6(3), 251-257.

Suggested References - 2

- Craik F.I.M. 2007. Encoding: A cognitive perspective. In (Eds. Roediger HL I.I.I., Dudai Y. & Fitzpatrick S.M.), *Science of Memory: Concepts* (pp. 129-135). New York, NY: Oxford University Press.
- Davidson, R.J. (2004). Well-being and affective style: neural substrates and biobehavioural correlates. *Philosophical Transactions of the Royal Society*, 359, 1395-1411.
- Dudai, Y. (2004). The neurobiology of consolidations, or, how stable is the engram?. *Annu. Rev. Psychol.*, 55, 51-86.
- Dweck, C. (2006). *Mindset: The new psychology of success*. Random House.
- Fredrickson, B. L. (2013). Positive emotions broaden and build. *Advances in experimental social psychology*, 47(1), 53.
- Garland, E. L., Fredrickson, B., Kring, A. M., Johnson, D. P., Meyer, P. S., & Penn, D. L. (2010). Upward spirals of positive emotions counter downward spirals of negativity: Insights from the broaden-and-build theory and affective neuroscience on the treatment of emotion dysfunctions and deficits in psychopathology. *Clinical psychology review*, 30(7), 849-864.

Suggested References - 3

- Hamann, S. B., Ely, T. D., Grafton, S. T., & Kilts, C. D. (1999). Amygdala activity related to enhanced memory for pleasant and aversive stimuli. *Nature neuroscience*, 2(3), 289-293.
- Hanson, R. 2011. *Hardwiring happiness: The new brain science of contentment, calm, and confidence*. New York: Harmony.
- Hölzel, B. K., Ott, U., Gard, T., Hempel, H., Weygandt, M., Morgen, K., & Vaitl, D. (2008). Investigation of mindfulness meditation practitioners with voxel-based morphometry. *Social cognitive and affective neuroscience*, 3(1), 55-61.
- Hölzel, B. K., Carmody, J., Evans, K. C., Hoge, E. A., Dusek, J. A., Morgan, L., ... & Lazar, S. W. (2009). Stress reduction correlates with structural changes in the amygdala. *Social cognitive and affective neuroscience*, nsp034.
- Jamrozik, A., McQuire, M., Cardillo, E. R., & Chatterjee, A. (2016). Metaphor: Bridging embodiment to abstraction. *Psychonomic bulletin & review*, 1-10.
- Kensinger, E. A., & Corkin, S. (2004). Two routes to emotional memory: Distinct neural processes for valence and arousal. *Proceedings of the National Academy of Sciences of the United States of America*, 101(9), 3310-3315.

Suggested References - 4

- Koch, J. M., Hinze-Selch, D., Stingele, K., Huchzermeier, C., Goder, R., Seeck-Hirschner, M., et al. (2009). Changes in CREB phosphorylation and BDNF plasma levels during psychotherapy of depression. *Psychotherapy and Psychosomatics*, 78(3), 187–192.
- 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.
- Lee, T.-H., Greening, S. G., & Mather, M. (2015). Encoding of goal-relevant stimuli is strengthened by emotional arousal in memory. *Frontiers in Psychology*, 6, 1173.
- Lutz, A., Brefczynski-Lewis, J., Johnstone, T., & Davidson, R. J. (2008). Regulation of the neural circuitry of emotion by compassion meditation: Effects of meditative expertise. *PLoS One*, 3(3), e1897.
- Madan, C. R. (2013). Toward a common theory for learning from reward, affect, and motivation: the SIMON framework. *Frontiers in systems neuroscience*, 7.
- Madan, C. R., & Singhal, A. (2012). Motor imagery and higher-level cognition: four hurdles before research can sprint forward. *Cognitive Processing*, 13(3), 211-229.

Suggested References - 5

- McEwen, B. S. (2016). In pursuit of resilience: stress, epigenetics, and brain plasticity. *Annals of the New York Academy of Sciences*, 1373(1), 56-64.
- McGaugh, J.L. 2000. Memory: A century of consolidation. *Science*, 287, 248-251.
- Nadel, L., Hupbach, A., Gomez, R., & Newman-Smith, K. (2012). Memory formation, consolidation and transformation. *Neuroscience & Biobehavioral Reviews*, 36(7), 1640-1645.
- Pais-Vieira, C., Wing, E. A., & Cabeza, R. (2016). The influence of self-awareness on emotional memory formation: An fMRI study. *Social cognitive and affective neuroscience*, 11(4), 580-592.
- Palombo, D. J., & Madan, C. R. (2015). Making Memories That Last. *The Journal of Neuroscience*, 35(30), 10643-10644.
- Paquette, V., Levesque, J., Mensour, B., Leroux, J. M., Beaudoin, G., Bourgouin, P. & Bearegard, M. 2003 Change the mind and you change the brain: effects of cognitive-behavioral therapy on the neural correlates of spider phobia. *NeuroImage* 18, 401-409.
- Rozin, P. & Royzman, E.B. (2001). Negativity bias, negativity dominance, and contagion. *Personality and Social Psychology Review*, 5, 296-320.

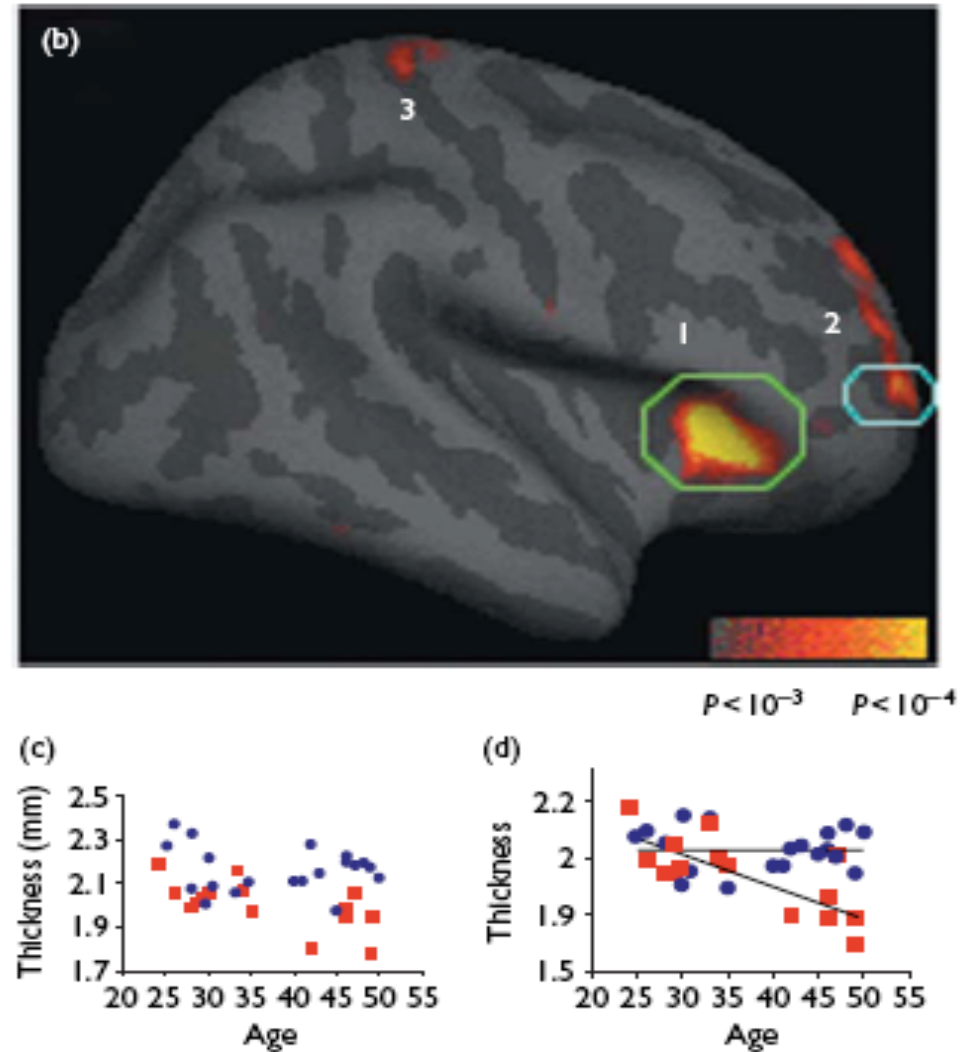
Suggested References - 6

- Sneve, M. H., Grydeland, H., Nyberg, L., Bowles, B., Amlien, I. K., Langnes, E., ... & Fjell, A. M. (2015). Mechanisms underlying encoding of short-lived versus durable episodic memories. *The Journal of Neuroscience*, 35(13), 5202-5212.
- Talmi, D. (2013). Enhanced Emotional Memory Cognitive and Neural Mechanisms. *Current Directions in Psychological Science*, 22(6), 430-436.
- Thompson, E. (2007). *Mind in life: Biology, phenomenology, and the sciences of mind*. Harvard University Press.
- Wittmann, B. C., Schott, B. H., Guderian, S., Frey, J. U., Heinze, H. J., & Düzel, E. (2005). Reward-related FMRI activation of dopaminergic midbrain is associated with enhanced hippocampus-dependent long-term memory formation. *Neuron*, 45(3), 459-467.
- Yonelinas, A. P., & Ritchey, M. (2015). The slow forgetting of emotional episodic memories: an emotional binding account. *Trends in cognitive sciences*, 19(5), 259-267.

Supplemental Materials

Meditation experience is associated with increased cortical thickness.

Lazar, et al. 2005.
Neuroreport, 16, 1893-1897.



In the Garden of the Mind

1

**Be with what
is there**

2

**Decrease
the negative**

3

**Increase
the positive**

Witness. Pull weeds. Plant flowers.
Let be. Let go. Let in.
Mindfulness is present in all three.

“Being with” is primary – but not enough.
We also need “wise effort.”

The Two Ways To Have a Beneficial Experience

① Notice one you are already having.

- In the foreground of awareness
- In the background

② Create one.

Two Aspects of Installation

Enriching

Mind – big, rich, protected experience

Brain – intensifying and maintaining neural activity

Absorbing

Mind – intending and sensing that the experience is received into oneself, with related rewards

Brain – priming, sensitizing, and promoting more effective encoding and consolidation

Enriching an Experience

- **Duration** – 5+ seconds; protecting it; keeping it going
- **Intensity** – opening to it in the mind; helping it get big
- **Multimodality** – engaging multiple aspects of experience, especially perception and emotion
- **Novelty** – seeing what is fresh; “don’t know mind”
- **Salience** – seeing why this is personally relevant

Absorbing an Experience

- Intend to receive the experience into yourself.
- Sense the experience sinking into you.
 - Imagery – Water into a sponge; golden dust sifting down; a jewel into the treasure chest of the heart
 - Sensation – Warm soothing balm
 - Give over to it; let it change you.
- Be aware of ways the experience is rewarding.

Four Ways to Use HEAL with Others

- Doing it implicitly
- Teaching it and leaving it up to people
- Doing it explicitly with people
- Asking people to do it on their own

HEAL in Classes and Trainings

- Take a few minutes to explain it and teach it.
- In the flow, encourage Enriching and Absorbing, using natural language.
- Encourage people to use HEAL on their own.
- Do HEAL on regular occasions (e.g., at end of a therapy session, at end of mindfulness practice)