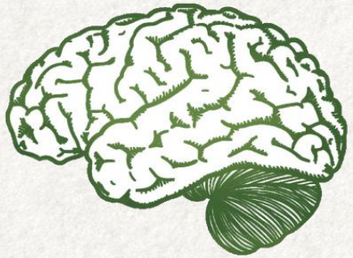
Growth 2.0:
Using Positive Neuroplasticity To Build Lasting Inner Strengths



Rick Hanson, Ph.D.

Greater Good Science Center, UC Berkeley

Global Compassion Coalition

www.RickHanson.net

Positive psychology
is fundamentally focused on **growth** –
in coping, well-being, and flourishing.

Lasting positive changes in the mind must
involve lasting positive changes in the **brain.**

How can we promote those neural changes by
how we **engage** the experiences we are having?

Shaping the Course of a Life

Challenges

Vulnerabilities

Resources

Location of Resources

World

Body

Mind

Resources in the Mind – Inner Strengths

Described variously as character strengths (Park, et al., 2004), virtues (Dahlsgaard et al., 2005; Fowers et al., 2021), psychological capital (Luthans & Youseff-Morgan, 2017), positive psychological traits (Martin et al., 2015), etc.

Examples include interpersonal skills, impulse control, positive mood, new perspectives, mindfulness, self-compassion, grit, gratitude, resilience, love, motivation, secure attachment, and wisdom.

The harder a person's life,
the more challenges one has,
the less the outer world is helping –

the more important it is
to have inner strengths like these.

To make this more real:

What are you trying to develop
inside the minds of the people you work with?

What are you trying to develop
inside yourself?

What – if it were more present inside
someone's mind – would help these days?

To a large extent, our inner strengths must be **acquired** (rather than innate) (Roberts et al., 2006; Skinner & Zimmer-Gembeck, 2007).

This acquisition is a two-stage process of social-emotional **learning**, broadly speaking, in which the neural correlates of experience are encoded into lasting changes in the brain (Josselyn et al., 2015).

Mechanisms of Neuroplastic Change

(De)Sensitizing existing synapses

Building new synapses

Building and integrating new neurons

Altered gene expression

Altered activity in a region

Altered connectivity among regions

Changes in neurochemical activity (e.g., dopamine)

Changes in neurotrophic factors (e.g., BDNF)

Modulation by stress hormones, cytokines

Information transfer from hippocampus to cortex

Slow wave and REM sleep

Inner strengths are acquired in two stages:

Encoding	›	Consolidation
Activation	›	Installation
State	›	Trait

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?

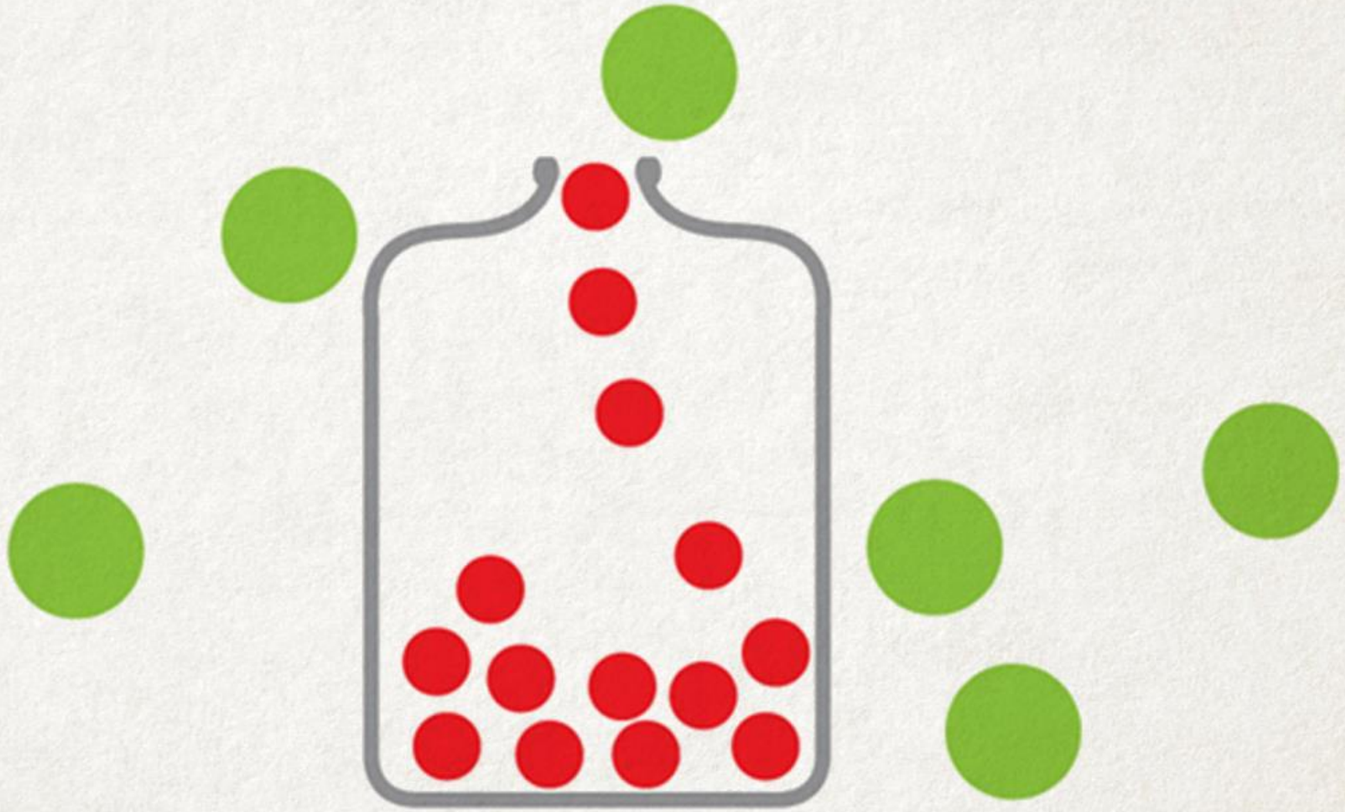
Formally and informally,
we tend to focus more on activation
than on installation.

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

And meanwhile, the brain's evolved
negativity bias continues to operate,

making us good at learning from bad experiences,

but bad at learning from good experiences
of the inner strengths we'd like to grow.



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. Create vicious cycles with others.

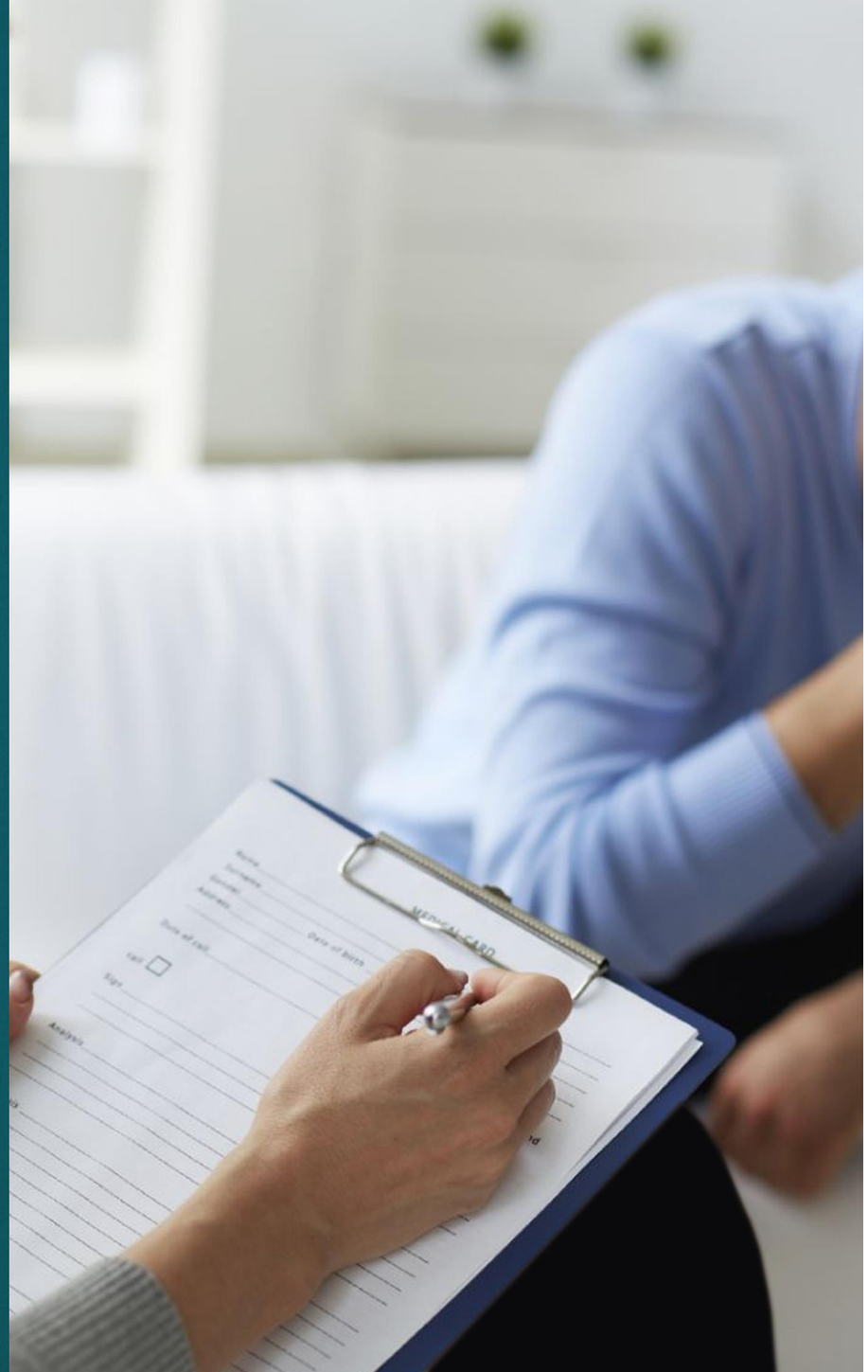
Velcro for Bad, Teflon for Good

How might often poor internalization
plus the negativity bias
affect the results of our efforts
– formal and informal –
in positive psychology, and related fields?

Let’s consider one well-studied area,
psychotherapy.

The same research that proves therapy works shows no improvement in outcome over the last 30 or so years.

Scott Miller



At this point,
developing new therapeutic experiences
may have diminishing returns,

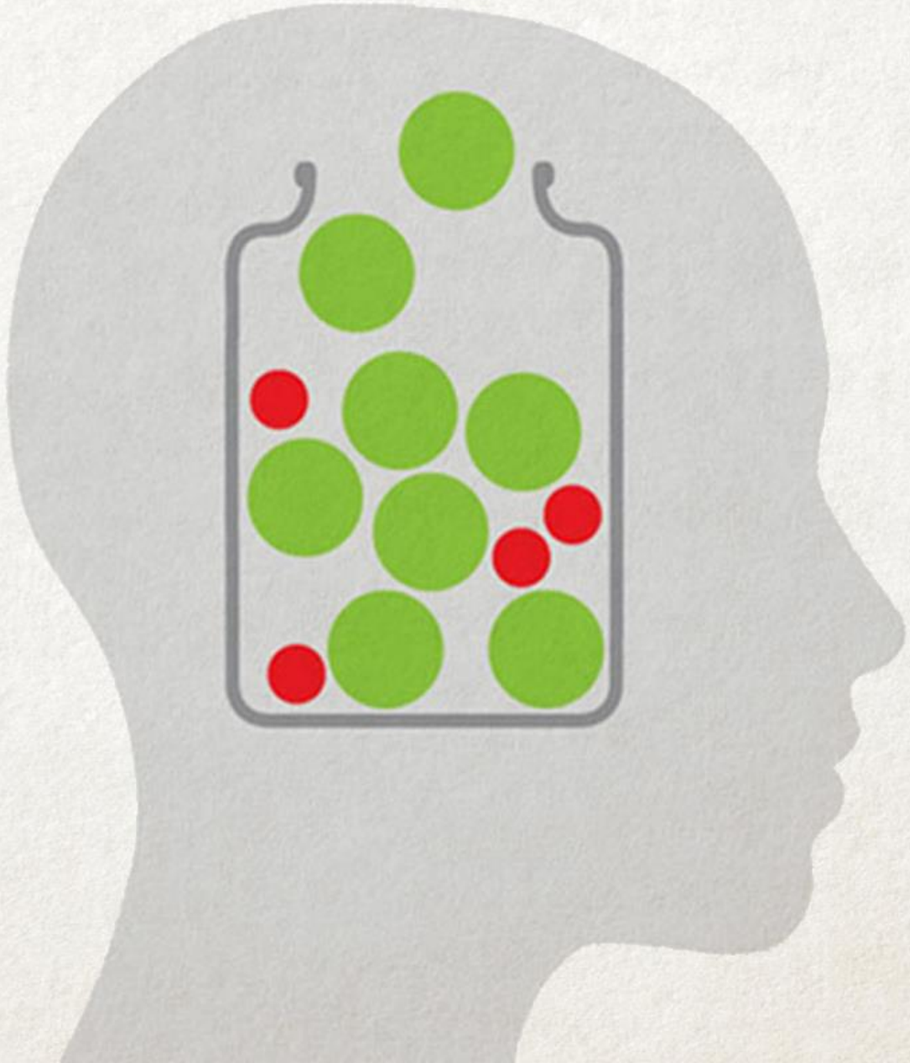
with greater opportunities
found in helping people
to increase the **internalization**
of the experiences
they are already having.

Positive psychology
has made great contributions
in its focus on identifying and using
inner strengths.

But what about developing these
in the first place??

Let's explore the **how**
of deliberate healing and growth.

Which Means Changing the Brain For the Better



Factors of Acquiring Inner Strengths

External:

Physiological (Zalta et al., 2013), environmental (O'Brien, 2009), behavioral (Kerner & Fitzpatrick, 2007)

Internal, Global:

Growth mindset (Dweck, 2006), vantage sensitivity (Pluess & Belsky, 2013), plasticity (Hirsh et al., 2009), mindfulness (Langer, 2016)

Internal, Engagement:

Applied deliberately to regulate experiences directly,
to support the internalization phase of learning,
and heighten the acquisition of psychological resources.

Nine Engagement Factors - 1

1. **Duration** – People can deliberately extend the duration of experiences (Waugh et al., 2014), which strengthens their effects (Pluess & Belsky, 2013; Zhu et al., 2018), including through heightened transfer into long-term memory stores (Ranganath et al., 2015).

2. **Intensity** – Intensifying our experiences (Quoidbach et al., 2015) increases norepinephrine and cortisol activity (Sara, 2009), which heightens learning through receptor sites in the amydala and hippocampus (Cahill & McGaugh, 1996).

3. **Multimodality** – Focusing on multiple aspects of an experience – thoughts, perceptions (especially sensations), emotions, desires, and actions – enhances learning from that experience (Ekuni et al., 2011; Olney et al., 2018; Talmi, 2013).

4. **Novelty** – The ventral tegmental area releases more dopamine in the hippocampus, promoting memory formation (Lisman & Grace, 2005).

Nine Engagement Factors - 2

5. **Salience** – As personal relevance increases, so does amygdala activation, promoting hippocampus-based memory formation (Cunningham et al., 2010).

6. **Intention** – The amygdala responds to what is motivationally important (Cunningham & Brosch, 2012), as we remember what we want to remember (Oyarzun et al., 2016).

7. **Interoception** – Focusing on multiple aspects of an experience – thoughts, perceptions (especially sensations), emotions, desires, and actions – enhances learning from that experience (Ekini et al., 2011; Olney et al., 2018; Talmi, 2013).

8. **Reward** – This increases dopamine and norepinephrine activity (McDonald & Hong, 2013; Sara & Segal, 1991), heightening synaptic formation in general plus protein synthesis in the hippocampus (Takeuchi et al., 2013), promoting memory formation.

Nine Engagement Factors - 3

9. **Linking** – We can expand the field of awareness to include "positive material" in the foreground (e.g., feeling cared about) along with related "negative material" (e.g., feeling left out and unwanted) in the background.

This both associates positive to negative to soothe and ease it, and potentially releases and replaces it through disrupting the reconsolidation of the negative material in neural networks (Ecker, 2015).

To use this factor, a person must be able to hold two things in awareness at once (or cycle rapidly between them), keep the positive material "bigger," and not get hijacked by the negative material.

Advantages of Engagement Factors

1. Can be mobilized rapidly and deliberately, unlike global factors that are more stable and less subject to volitional control

2. Have direct regulatory involvement with experiences (Quoidbach et al., 2015), thus increasing a person's influence over them and what is gained from them.

3. Learning depends mainly on neural activity during an experience (Craik & Lockhart, 1972; Takeuchi et al., 2014), and engagement factors heighten encoding and consolidation *while* experiences are occurring.

4. Could increase the sense of agency in acquiring inner strengths, which could increase motivation and "ownership" of the results.

5. Can be used in brief episodes (e.g., during a single breath), creating multiple opportunities to internalize beneficial experiences each day.

Any one of the nine engagement factors
could increase the development of inner strengths.

Now let’s consider them together
in a single practical framework.

Turning States into Traits: HEAL

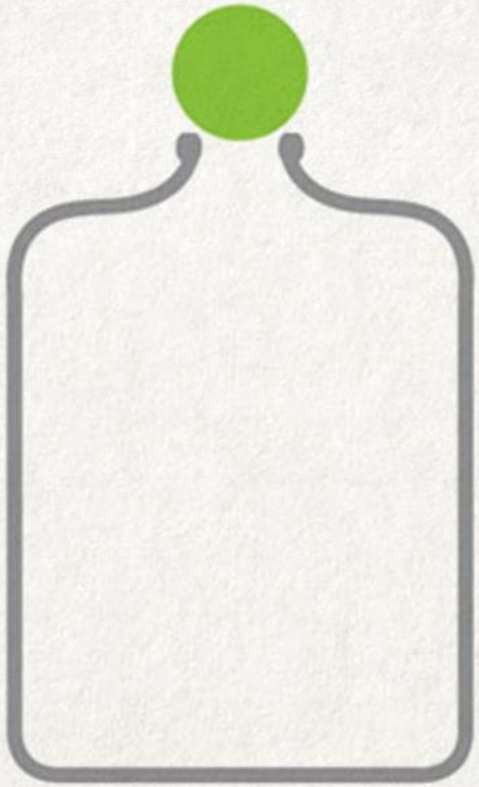
Activation

1. **Have** a beneficial experience

Installation

2. **Enrich** the experience
3. **Absorb** the experience
4. **Link** positive and negative material

(Optional)



Have a Beneficial Experience

Two Aspects of Installation

Enriching

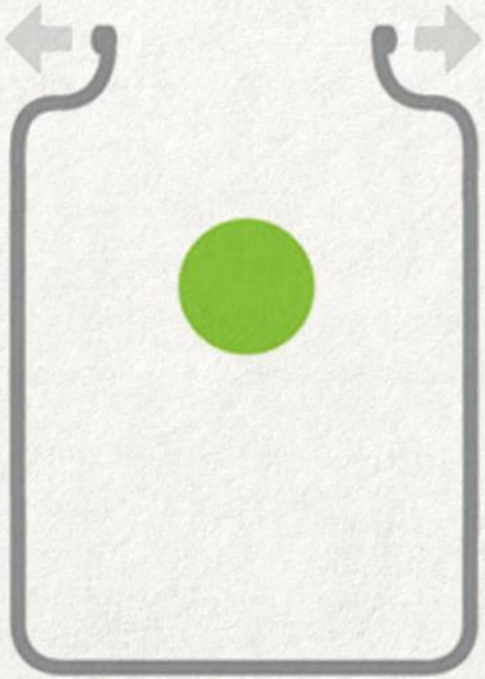
Mind – big, rich, protected experience

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



Enrich It

Enriching an Experience

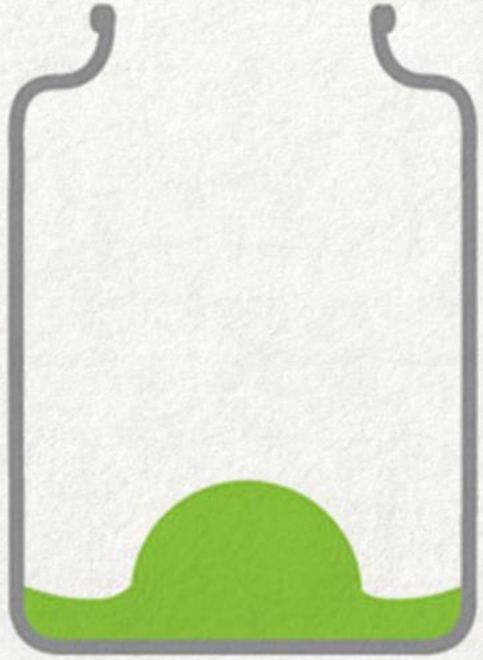
Duration – 5+ seconds; protect it; keep it going

Intensity – open to it in the mind; help it get big

Multimodality – explore different aspects of the experience, especially sensation and emotion

Novelty – see what is fresh; “don’t know mind”

Salience – appreciate what is personally relevant



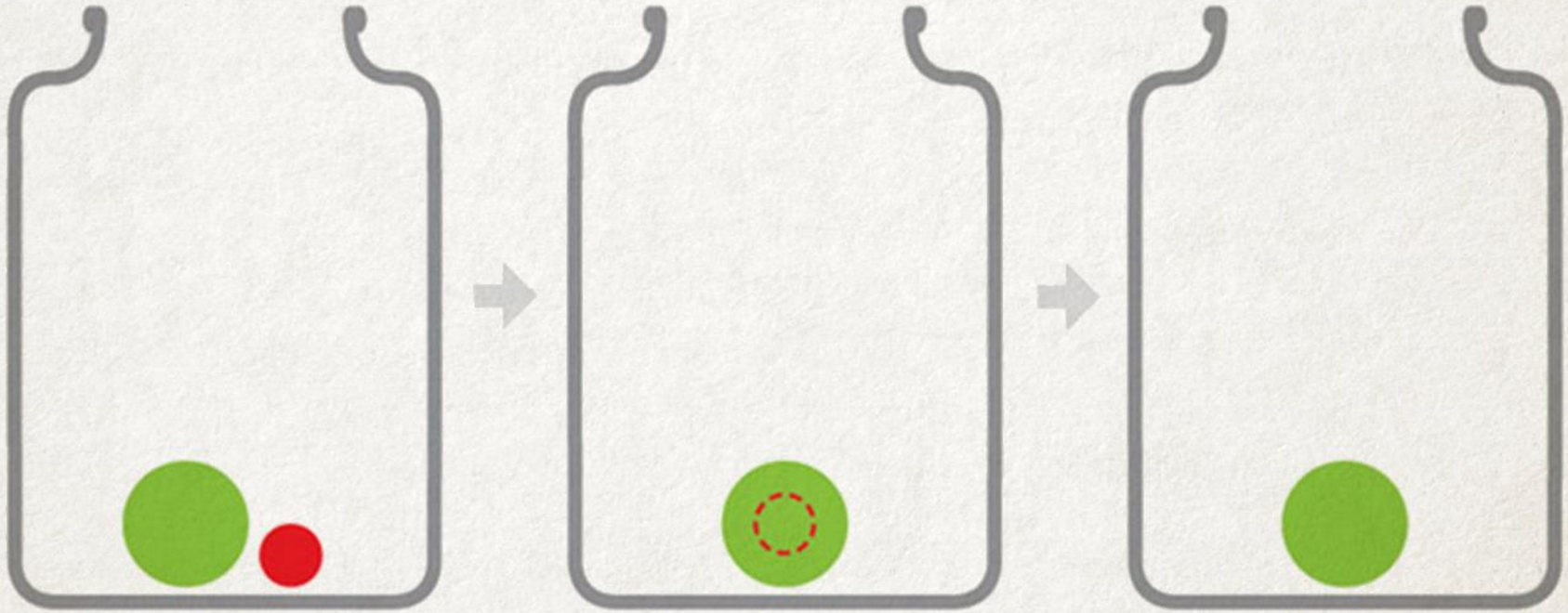
Absorb It

Absorbing an Experience

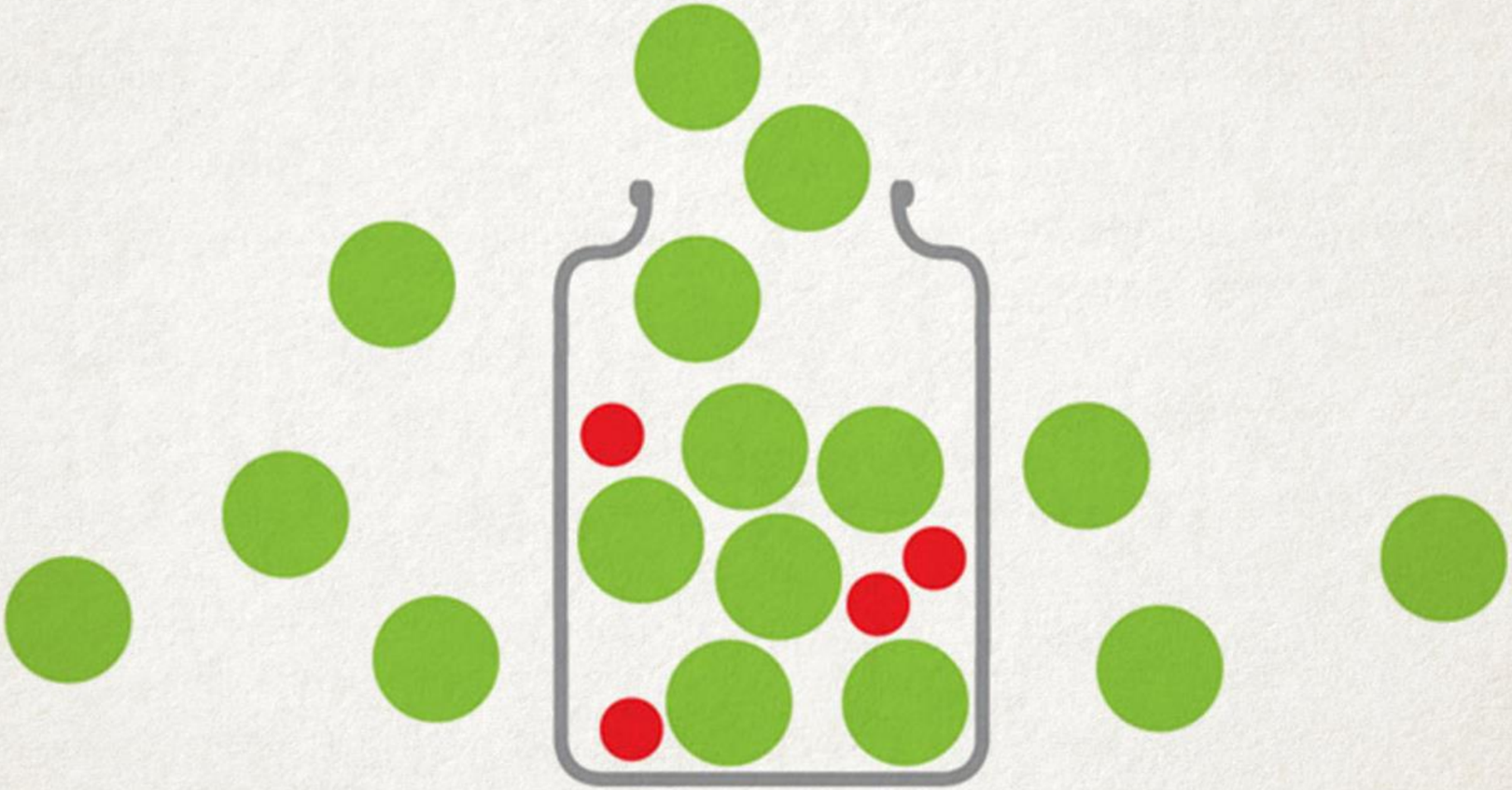
Intention – decide to receive this experience into yourself; give over to it; let it "have" you

Interoception – sense the experience sinking into you; use imagery, like water into a sponge; use sensation, like a warm soothing balm sinking into you

Reward – highlight and stay with what is enjoyable, useful, or meaningful in the experience



Link Positive & Negative Material



Have It, Enjoy 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

Results of an Exploratory Study

The 18-hour "Taking in the Good Course" (the Positive Neuroplasticity Training) teaches the HEAL framework and applies it to growing specific inner strengths.

In a multiple arm, pre-post intervention study, participants reported significant increases in self-compassion, contentment, and joy, and decreases in depressed mood; these persisted two months after the course ended.

Hanson, R., Shapiro, S., Hutton-Thamm, E., Hagerty, M. R., & Sullivan, K. P. (2023). Learning to learn from positive experiences. *The Journal of Positive Psychology*, *18*(1), 142-153.

Growth 1.0

People are regarded as passive vessels into which information and experiences are poured, in the hopes that something will stick.

For some, it does. In research, these “high responders” can increase the group average above statistical significance.

But what about the third or more – roughly – in many studies who report little or no durable benefit?

There may be upward spirals (Garland et al.,2010) of positive experiences → actions → additional positive experiences, but these experiential states are vulnerable to disruption if conditions change; lasting traits are more reliable than passing states.

Growth 2.0

People are regarded as active agents in the conversion of their experiences into durable changes of neural structure or function.

They learn and use engagement factors to increase the internalization of experiences of inner strengths.

This is not becoming more effective at generating beneficial experiences, but becoming more effective at learning from them.

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

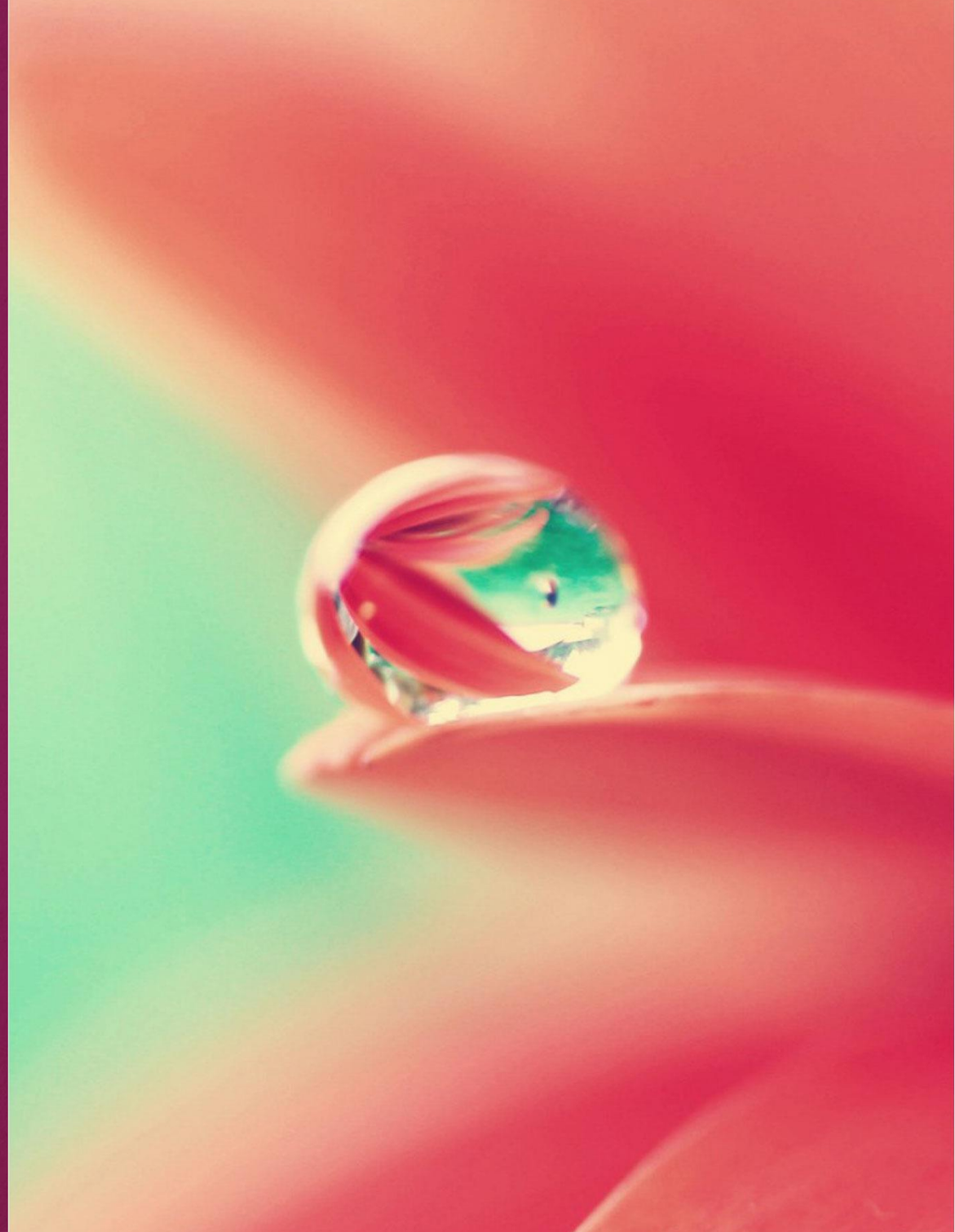
Knowing how to learn
the things that are important to you
could be the greatest strength of all.

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

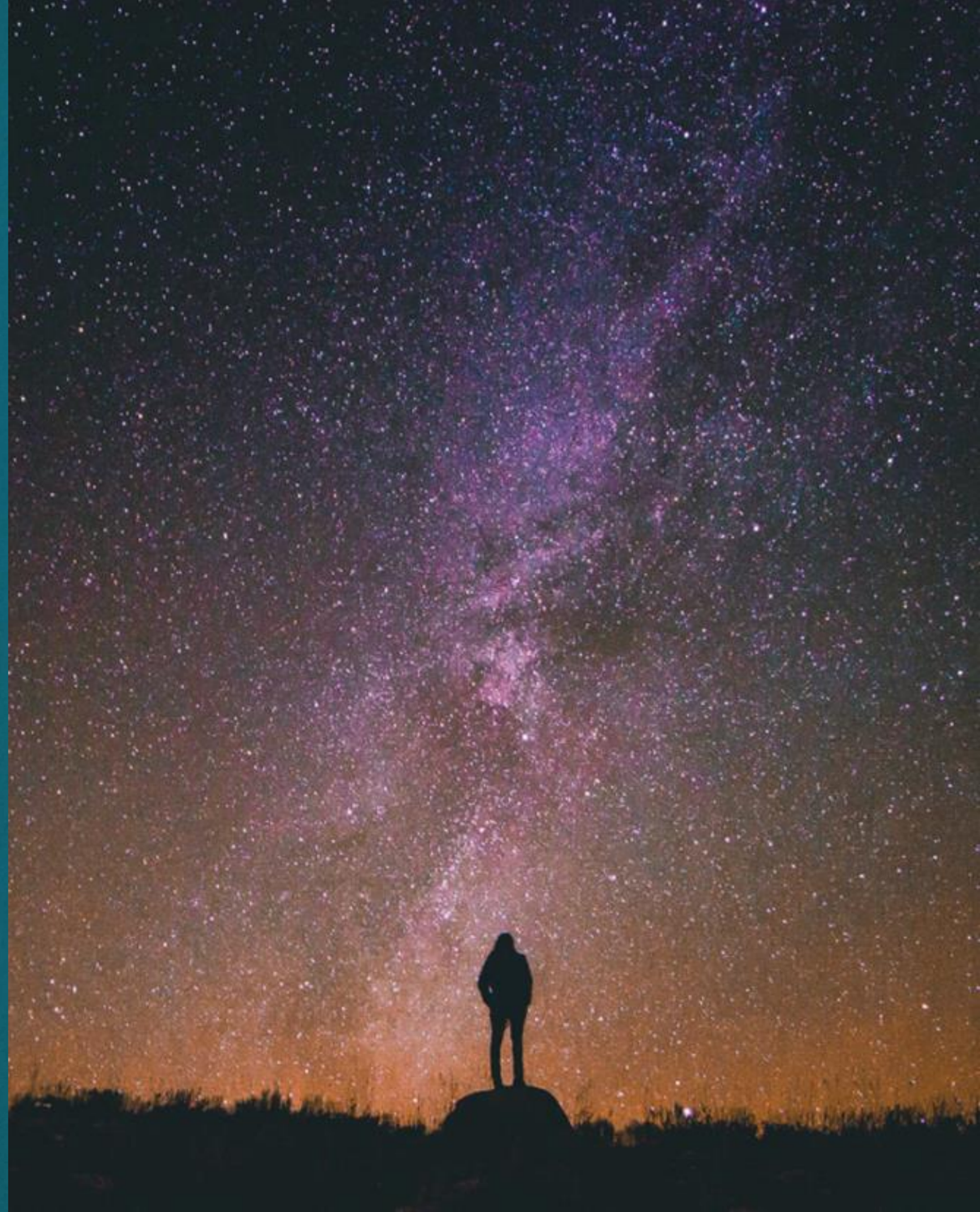


In the beginning,
nothing came.

In the middle,
nothing stayed.

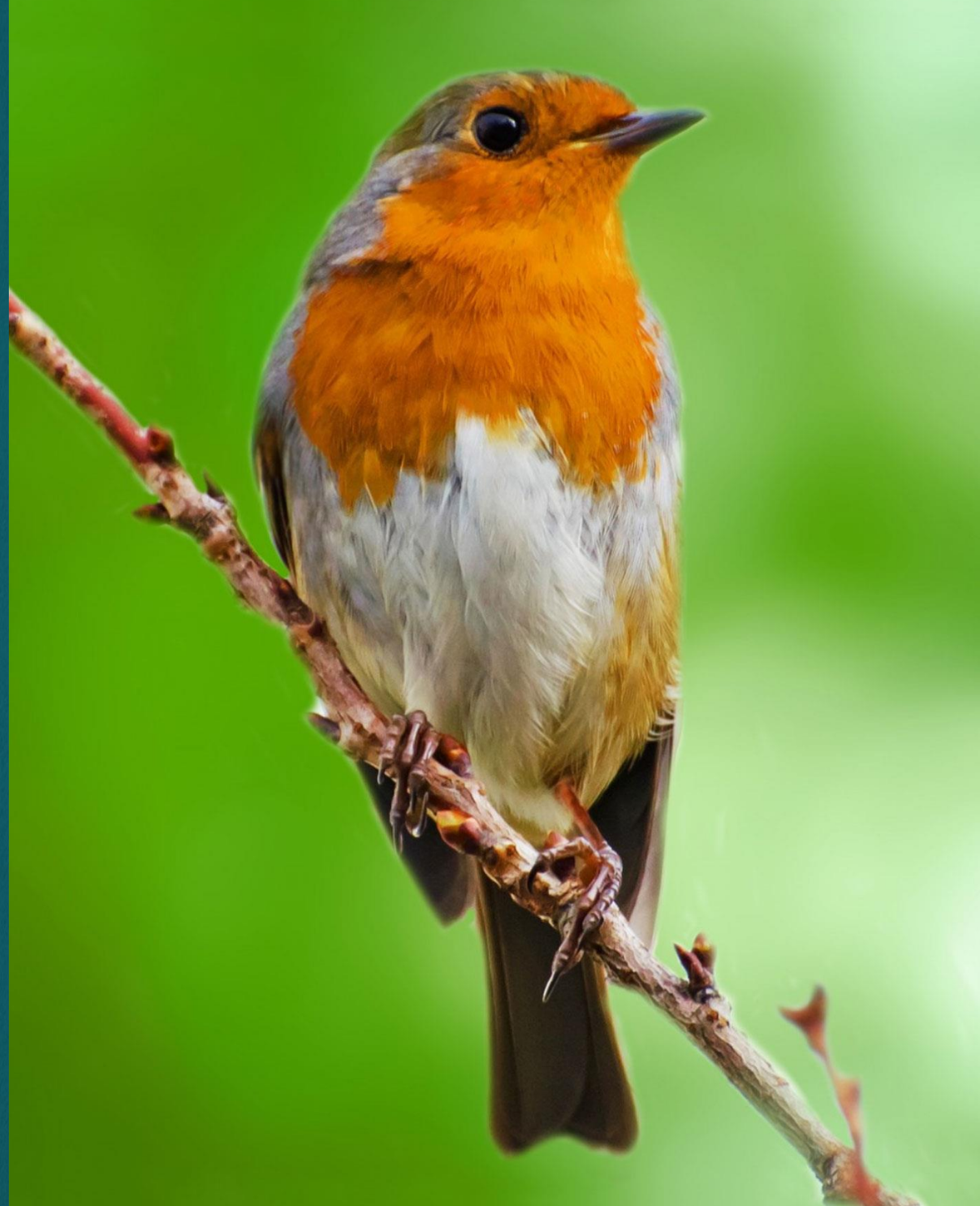
In the end,
nothing left.

Milarepa



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

Lao Tzu



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.

Thank You

References

Selected References - 1

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.

Cahill, L., & McGaugh, J. L. (1996). Modulation of memory storage. *Current Opinion in Neurobiology, 6*2(2), 237–242, http://dx.doi.org/10.1016/S0959-4388(96)80078-X.

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.

Craik, F. I. M., & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior, 11*(6), 671–684., http://dx.doi.org/10.1016/S0022-5371(72)80001-X.

Cunningham, W. A., Arbuckle, N. L., Jahn, A., & Mowrer, S. M. (2010). Aspects of neuroticism and the amygdala: Chronic tuning from motivational styles. *Neuropsychologia, 48*(12), 3399–3404, http://dx.doi.org/10.1016/j.neuropsychologia.2010.06.026.

Cunningham, W. A., & Brosch, T. (2012). Motivational salience: Amygdala tuning from traits, needs, values, and goals. *Current Directions in Psychological Science, 21*(1), 54–59, http://dx.doi.org/10.1177/0963721411430832.

Dahlsgaard, K., Peterson, C., & Seligman, M. E. P. (2005). Shared virtue: The convergence of valued human strengths across culture and history. *Review of General Psychology, 9*(3), 203–213, http://dx.doi.org/10.1037/1089-2680.9.3.203.

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*. New York: Random House.

Selected References - 2

Ecker, B. (2015). Memory reconsolidation understood and misunderstood. *International Journal of Neuropsychotherapy, 3*, 2–46, http://dx.doi.org/10.12744/ijnpt.2015.0002-0046.

Ekuni, R., Vaz, L. J., & Bueno , O. F. A. (2011). Levels of processing: The evolution of a framework. *Psychology & Neuroscience, 4*(3), 333–339, http://dx.doi.org/10.3922/j.psns.2011.3.006.

Fowers, B. J., Carroll, J. S., Leonhardt, N. D., & Cokelet, B. (2021). The emerging science of virtue. *Perspectives on Psychological Science*, *16*(1), 118-147.

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.

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.

Hanson, R., Shapiro, S., Hutton-Thamm, E., Hagerty, M. R., & Sullivan, K. P. (2023). Learning to learn from positive experiences. *The Journal of Positive Psychology*, *18*(1), 142-153.

Hirsh, J. B., DeYoung, C. G., & Peterson, J. B. (2009). Metatraits of the Big Five differentially predict engagement and restraint of behavior. *Journal of Personality, 77*(4), 1085–1102, http://dx.doi.org/10.1111/j.1467-6494.2009.00575.x.

Selected References - 3

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.

Kerner, E. A., & Fitzpatrick, M. R. (2007). Integrating writing into psychotherapy practice: A matrix of change processes and structural dimensions. *Psychotherapy: Theory, Research, Practice, Training*, *44*(3), 333–346, http://dx.doi.org/10.1037/0033-3204.44.3.333.

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.

Luthans, F., & Youssef-Morgan, C. M. (2017). Psychological capital: An evidence-based positive approach. *Annual Review of Organizational Psychology and Organizational Behavior*, *4*, 339–366, http://dx.doi.org/10.1146/annurev-orgpsych-032516-113324.

Madan, C. R. (2013). Toward a common theory for learning from reward, affect, and motivation: the SIMON framework. *Frontiers in systems neuroscience*, *7*.

Martin, A. S., Harmell, A. L., & Mausbach, B. T. (2015). Positive psychological traits. In D. V. Jeste, & B. W. Palmer (Eds.), *Positive psychiatry: A clinical handbook* (pp. 19–43). Arlington, VA: American Psychiatric Publishing.

McDonald, R. J., & Hong, N. S. (2013). How does a specific learning and memory system in the mammalian brain gain control of behavior? *Hippocampus*, *23*(1), 1084–1102, http://dx.doi.org/10.1002/hipo.22177.

McGaugh, J.L. 2000. Memory: A century of consolidation. *Science*, 287, 248-251.

O'Brien, L. (2009). Learning outdoors: The Forest School approach. *Education 3–13*, *37*(1), 45–60, http://dx.doi.org/10.1080/03004270802291798.

Selected References - 4

Olney, J. J., Warlow, S. M., Naffziger, E. E., & Berridge, K. C. (2018). Current perspectives on incentive salience and applications to clinical disorders. *Current Opinion in Behavioral Sciences, 22*, 59–69, http://dx.doi.org/10.1016/j.cobeha.2018.01.007.

Oyarzún, J. P., Packard, P. A., de Diego-Balaguer, R., & Fuentemilla, L. (2016). Motivated encoding selectively promotes memory for future inconsequential semantically-related events. *Neurobiology of Learning and Memory, 133*, 1–6, http://dx.doi.org/10.1016/j.nlm.2016.05.005.

Palombo, D. J., & Madan, C. R. (2015). Making memories that last. *The Journal of Neuroscience*, *35*(30), 10643-10644.

Park, N., Peterson, C., & Seligman, M. E. (2004). Strengths of character and well-being. *Journal of Social and Clinical Psychology, 23*(5), 603–619, http://dx.doi.org/10.1521/jscp.23.5.603.50748.

Pluess, M., & Belsky, J. (2013). Vantage sensitivity: Individual differences in response to positive experiences. *Psychological Bulletin, 139*(4), 901–916, http://dx.doi.org/10.1037/a0030196.

Quoidbach, J., Mikolajczak, M., & Gross, J. J. (2015). Positive interventions: An emotion regulation perspective. *Psychological Bulletin, 141*(3), 655–693, http://dx.doi.org/10.1037/a0038648.

Ranganath, C., Cohen, M. X., & Brozinsky, C. J. (2005). Working memory maintenance contributes to long-term memory formation: Neural and behavioral evidence. *Journal of Cognitive Neuroscience, 17*(7), 994–1010, http://dx.doi.org/10.1162/0898929054475118.

Rozin, P. & Royzman, E.B. (2001). Negativity bias, negativity dominance, and contagion. *Personality and Social Psychology Review*, *5*, 296-320.

Sara, S. J. (2009). The locus coeruleus and noradrenergic modulation of cognition. *Nature Reviews Neuroscience, 10*(3), 211–223, http://dx.doi.org/10.1038/nrn2573.

Selected References - 5

Sara, S. J., & Segal, M. (1991). Plasticity of sensory responses of locus coeruleus neurons in the behaving rat: Implications for cognition. *Progress in Brain Research, 88*, 571–585, http://dx.doi.org/10.1016/S0079-6123(08)63835-2.

Talmi, D. (2013). Enhanced emotional memory: Cognitive and neural mechanisms. *Current Directions in Psychological Science, 22*(6), 430–436, http://dx.doi.org/10.1177/0963721413498893.

Takeuchi, T., Duszkiewicz, A. J., & Morris, R. G. M. (2014). The synaptic plasticity and memory hypothesis: Encoding, storage and persistence. *Philosophical Transactions of the Royal Society B, 369*(1633), 1–14, https://doi.org/10.1098/rstb.2013.0288.

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.

Zhu, Y., Nachtrab, G., Keyes, P. C., Allen, W. E., Luo, L., & Chen, X. (2018). Dynamic salience processing in paraventricular thalamus gates associative learning. *Science, 362*(6413), 423–429, http://dx.doi.org/10.1126/science.