

Brain Morsels: Packet 8



EACH BRAIN MATTERS
THE CENTER FOR NEUROSCIENCES FOUNDATION

And now for something rather wild:
How beliefs about aging affect you as you age

This month we are taking a short break from our ongoing discussion of the pillars of brain health to explore a subject that can have surprisingly powerful effects on how we age. The story begins with understanding *how the brain learns* – not in the molecular details, which indeed are fascinating (but maybe mostly to neuroscientists). But rather in the sense that *the working brain is constantly looking for patterns*. We’ve touched on this before. By understanding patterns - in our bodies, in the world around us physically, emotionally, and socially, our brains can stay particularly alert to changes, changes to which we might very well need to attend. When the brain has learned a pattern, and the sensory systems provide the brain with information that more or less matches the pattern, then the brain says, figuratively, oh, I know that pattern. I know how to behave or where to go or how to respond.

This pattern generation process means that the brain does not need to expend a lot of energy figuring out each set of information it receives. It also means that we seek to put new information into known pattern boxes, often ignoring information that does not fit the pattern. We’ve talked about mental models – like “I can’t do math,” ignoring perhaps the result of a good test because, “well, I’m not good at math!” We have stereotypes, which can be positive or negative, but which often lead us to overgeneralize. *All* adolescents are moody, or the members of certain ethnic groups are excellent cooks.

And where do these patterns come from? How do we develop them? Are they fixed or can they be changed?

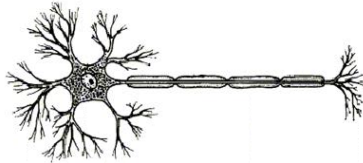
They can begin with our earliest experiences *in utero*, in the last part of pregnancy, as the newly forming brain begins to use its rudimentary circuitry to figure out its world. In the last trimester, for example, hearing is developed enough that the fetus begins to listen to the sounds within the mother’s body, like the heartbeat, and muted sounds from the world outside the womb, like music and words. By the time the baby is born, it already “knows” the rhythms of the mother’s language, and the brain begins to assemble structured language based on those rhythms.

As the baby moves with rather random movements – its arms and legs waving about, the brain receives information from sensory receptors like the eyes, joint receptors, muscle and skin receptors. The brain then begins to figure out how to control those arms and legs, and one day, a hand reaches out purposefully for a parent’s finger and grasps it.

Similar patterns emerge in the brain for social interactions. Think of the enormity of the tasks that underlie social interactions – from recognizing individuals and groups, from learning to

understand intent and emotions, to learning the norms of our culture, to figuring out educational and job systems, to learning to handle stress in difficult interactions, or learning to negotiate.

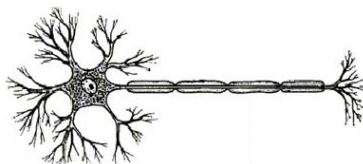
A word though about those all-important cultural norms. Most of the individuals around us embody those norms in what they say, in their way of behaving, and in how they view the world around them. Those norms then effectively osmose into our children via our example and the rules we put in place for them, in how we think about and interpret for them certain aspects of our world, and in what they learn in school and from various media. In other words, we begin learning those patterns from the get-go. We incorporate those norms and our own experiences into the brain's pattern system, and they operate unconsciously. A person who is now, say 70 years old, has a set of beliefs about aging that have developed over about 6 decades, *before* they become self-relevant to that person.



Activity

(Suggested by Becca Levy, *Breaking the Age Code* (2022) New York: Harper Collins Publishers)
Think of an old person, or the words “aging” or “aged” (and we’re not talking wine or cheese here). The person can be someone in particular, or just a generic old person. Now write down the first five words or phrases that come to mind. No right or wrong answers. Don’t think too much.

Does your list contain mostly negative or mostly positive descriptors? Some of each? Keep your list; we’ll come back to it.



Where do these age-related beliefs come from? Well, to give a few examples: experiences with our grandparents and other elders, fairy tales and other stories, and media portrayals of old people. In some countries, elders are generally considered to be in decline and to be a burden, offering little or nothing to the society (in the US, for example); in other countries (Japan, for example), elders are considered resources, able to use the experiences of their long lives to contribute ideas, to be central to discussion about how to move society forward, to mentor younger people, and to contribute to the work of the family. Some of us have had grandparents with whom we got to spend time, who loved us with all their being, who were active in their communities; others had grandparents whom we rarely saw, or who were in poor health and in

need of much care. A caveat on that last phrase, “in need of much care.” In many societies, that translates into a burden only; in others, yes, a caregiving burden, but one accepted as a positive thing one can do for another who has given so much in their lifetime. In the U.S., our society is structured in such a way that multi-generational households, or even multi-generational communities, are unusual, so many children grow up with little exposure to elders.

And the Western fairy tales! They are rife with images of crones and hags. Rarely are old people shown positively. Our media – the old are almost always depicted as in poor health, in decline, stooped, wrinkly, arthritic, confused, grumpy, depressed and demented, except when they are improved by drugs. Pharmaceutical companies spend billions to convince us that we need all sorts of anti-aging products. Our ads show young people decrying their first gray hairs or needing plastic surgery or botox and the like to erase those signs of aging, the ones showing up in their 20s and 30s! Interactions with clerks often begin with the clerk addressing us as “young lady” – when the person in front of them is clearly 80 or more – or “dearie”, or “honey.” Or the tone of voice betrays the agent’s belief that the old person is to be pitied or cannot manage on their own. Infantilizing elders is ridiculously common in our U.S. society.

In health care, physicians often dismiss concerns as simply a result of getting old, as if, somehow, the bodies of elders cannot be treated, that muscles cannot be rehabilitated, that depression is just a common feature of aging. Older patients often are excluded from formal studies, and even from decisions about their care. Many physicians simply believe that depression and high blood pressure are normal in the aging population and also fail to acknowledge that many elders have rich and enjoyable sex lives. Why? In part because geriatrics is a discipline not taught specifically in the curricula of most medical schools (Bardach & Rowles, 2012)¹, and geriatricians, of whom there are far too few, are among the poorest paid medical practitioners (salary.com). Only 2% of US hospitals have geriatric emergency departments (Sutherland et al., 2020)². Roughly the same patterns hold for nurses and physical therapists as well as mental health therapists. Furthermore, companies benefit hugely from the disabilities of the aged by focusing on expensive procedures, drugs, and medical equipment rather than on less expensive approaches like exercise and diet and even approaches that encourage more social interaction, especially intergenerational ones.

Another commonly held belief is that older individuals are especially prone to mental illness. Not true! Mental illness rates among the elderly are lower, by nearly half, than those among adolescents! And those illnesses are generally treatable to some degree! The problem is that so many health professionals believe this myth, especially regarding depression and especially regarding the idea that elders with a mental illness respond poorly, if at all, to treatment. Those stereotypes often lead to undertreatment of elders (Hinrichsen, 2015; Robb et al., 2002³). On

¹ Bardach & Rowles (2012) *The Gerontologist*, 52:607-618.

² Sutherland et al. (2020) *Annals Emergency Medicine*, 75: 162-170.

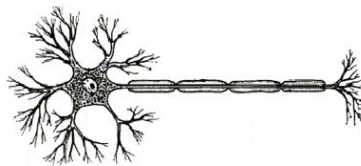
³ Hinrichsen (2015) in Lichtenberg et al. (Eds.) *APA Handbook of Clinical Geropsychology* pp 363-377, Washington, DC: American Psychological Association; Robb et al. (2002) *Journal of Clinical Geropsychology* 8:1-12.

the other hand, these unexamined beliefs may also contribute to overuse of medication, especially in nursing homes and memory-care facilities, leading to sedation, confusion, falls, and cognitive impairment (Brown, 2018)⁴.

And what about all those cards that make a joke about being over the hill or creeping toward senility! Sometimes those gets really “old.”

Financial institutions and other corporate institutions often exclude elders from housing and job listings or prey on elders who worry about their resources. Age is often seen negatively in the workplace, too. In many workplaces, there is a required retirement age, regardless of an individual’s capability or desires. Yet research has shown repeatedly that older workers are creative, have less turnover, less absenteeism and fewer accidents (Butler, 2008)⁵. Experiments with inter-generational teams have shown them to be effective and productive with fewer accidents, in large part because the older workers brought well-developed skills and strategies to the work (Conley, 2018)⁶, skills and strategies that they shared with younger members of the team. Of course, these exclusionary practices are *not* universal, and many organizations work positively with and for aging individuals.

Taken together, negative stereotypes about aging and the aged are broadly disseminated across our society and reflected in individual and corporate behavior. The aged are generally less valued and often simply invisible. Our brains began to assimilate these negative stereotypes, or models about aging, as babies, and now, if you have become an elder, truly an achievement to be celebrated, all those belief patterns suddenly have become relevant to oneself!



The effects of our own beliefs about aging on ourselves

Aging is, of course, a biological process, but it turns out that that process is quite astonishingly influenced by our beliefs about aging. A person’s negative beliefs *can* be changed, though it will take some work, and some mindfulness! Those beliefs can be changed because of a brain property we have described before, namely neuroplasticity, the ability of the brain to change in ways that optimize brain function and allow us to adapt better to the world we navigate. If we choose to work toward having a more positive personal belief system about aging, we are reworking our brain’s existing patterns about aging.

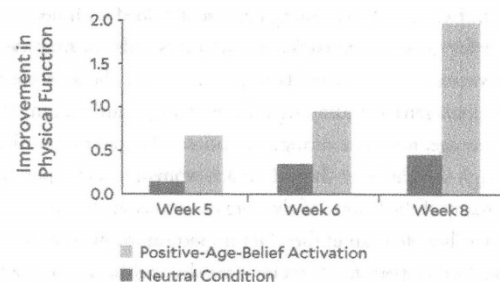
⁴ Brown (April 24, 2018) <https://law.yale.edu/yls-today/news/bethany-brown-discusses-human-rights-violations-us-nursing-homes>

⁵ Butler, RN (2008) *The Longevity Revolution: The Benefits and Challenges of Living a Long Life*. New York: Public Affairs Books. ISBN: 978-1-58648-553-5.

⁶ Conley, C (2018) *Wisdom @ Work: The Making of a Modern Elder*. New York: Crown Currency.

Becca Levy's work over several decades has revealed some of the ways that our own beliefs about aging affect our brain function and our physical and emotional health⁷. One powerful contribution to this body of work has been the Baltimore Longitudinal Study of Aging (BLSA), which began in 1958 and continues to this day. One of the earliest cohorts in that study had completed an age-belief measure. Levy matched the subjects' memory scores over the next 38 years and found that those who held positive age beliefs at the beginning of the study had 30% better memory scores in their sixties compared to those in the study who had negative scores at the beginning (Levy et al., 2012)⁸. Statistical tests showed that the better memory scores in the positive group were predicted by subjects' longstanding positive beliefs about aging, not that their positive age beliefs were due to better health.

In a previous packet, we discussed the benefits of exercise to brain health. Here's an additional, rather remarkable finding. In one study (Levy et al., 2014)⁹, Levy asked elders to do some short computer-based work during which they were exposed subliminally to positive words (like "spry" and "fit"). That is, such words flashed on the screen very briefly, long enough that the brain detected them, but the person never consciously saw them and thus was not aware of them. This "priming" occurred at one-week intervals for a month. The control group was primed only with random letters. The results showed that the group primed with positive words had significantly faster walking, better balance, and reported feeling better overall than those in the control group. Notice, too, that the improvement grew, even with no additional priming, in the second month!



Positive age beliefs also serve as a stress buffer. Remember from an earlier packet about stress that activation of the stress response by the brain results in the release of adrenaline and cortisol. Adrenaline gives us the boost in heart and respiratory rates that gives us the ability to generate a fight-or-flight response while cortisol gives us the necessary energy. *But*, chronic stress and the associated chronically higher cortisol is damaging. Energy reservoirs can be exhausted, and cortisol reduces neuronal branching and synaptic connections between neurons, especially in the hippocampus, that key memory center.

Levy and her colleagues returned to the Baltimore Longitudinal Study of Aging, this time following cortisol levels, which had been measured in each subject every 3 years for 3 decades (Levy et al., 2016)¹⁰.

⁷ Levy, B (2022) *Breaking the Age Code* New York: Harper Collins Publishers.

⁸ Levy et al. (2012) *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 67:432-436.

⁹ Levy et al. (2014) *Psychological Science* 25:2127-35.

¹⁰ Levy et al. (2016) *Journal of Gerontology and Geriatric Psychiatry* 29:141-146.

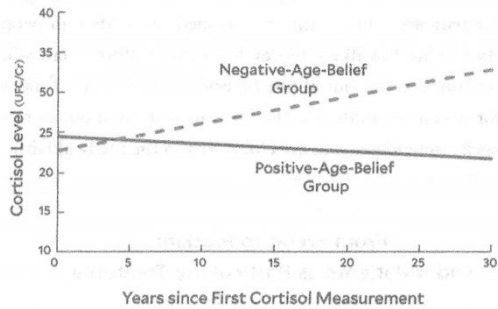
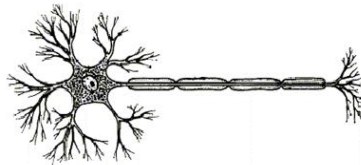


Figure 3: Stress Increases Across 30 Years for Older Participants with Negative Age Stereotypes. Participants holding these stereotypes showed an increase in the stress biomarker cortisol; whereas, those holding positive age stereotypes showed a decline in this stress biomarker.

The graph to the left clearly shows that cortisol levels increase over the decades for those with a negative age belief while cortisol levels decreased about 10% in those with a positive age belief. The negative effects of prolonged cortisol exposure would certainly be present in those with longstanding negative age beliefs.

Activities

1. Expanding on the list you created earlier, think deeply about your overall beliefs about aging. How do they affect how you interact with young people, with physicians and other health care professionals or lawyers, with clerks in stores, and so forth? Do you sometimes wish to give the evil eye to someone who says, "Can I help you, Dearie?" or do you just wave it off?
2. How do people speak to you? Do they speak more loudly, or use simple words, or slow their speech?
3. Can you bring to mind elders who are positive role models? Why do you think they fill that role? Have a conversation with others about this.
4. Here's something to try with some friends. While you are watching a movie that includes some older actors, or reading a magazine (OK, not the AARP magazine!), do you see negative stereotypes about elders? Discuss these. Awareness is the first step in changing your own beliefs.
5. Do you engage in any intergenerational activities? Could be fun, and help those young'uns dispel some of their negative beliefs about aging.



Now here is a rather astonishing finding. Levy and colleagues used data from the Ohio Longitudinal Study on Aging and Retirement, which generated highly detailed information about all sorts of topics but, importantly, included the subjects' thoughts on aging. The researchers who began the original study tried to get as many residents of an Ohio town over the age of 50 as they could to participate, regardless of what job they did, what church they attended, where they lived in town, what their socio-economic status was, or what their political outlook was.

There was an age-belief survey at the beginning of the study for each participant. Levy et al. (2002)¹¹ then asked: Does a person's belief about aging affect their longevity? They used data from the National Death Index, which tracks the longevity of all Americans, to determine when individual subjects in the Ohio study had died.

What they found was that participants with the most-positive views of aging lived, on average, 7 ½ years longer than those with the most-negative views regardless of all the other factors that could affect longevity! Holy moly!

What all this suggests is that the biological code in our DNA is only part of our destiny. Our beliefs about aging apparently can affect how our genes are expressed. Even those of us in the

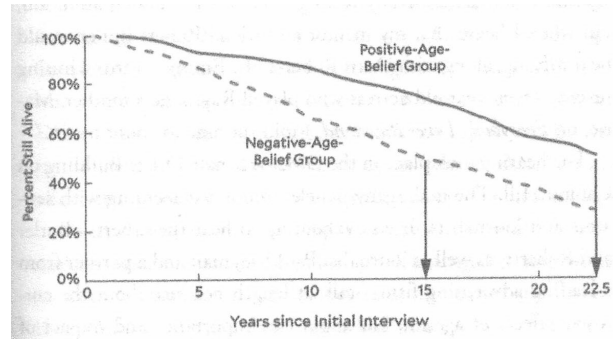


Figure 4: Survival Advantage from Positive Age Beliefs. Participants with positive age beliefs lived an average of 7.5 years longer than those with negative age beliefs. This was calculated by examining the group difference in the time it took for half the people to be still living, as indicated by arrows.

15% of the population born with the APOE4 gene, which increases our risk of Alzheimer's Disease! Continuing their study of the effect of age beliefs on the aging of our brains, Levy and colleagues recruited more than 5000 older people and found that those with positive age beliefs were 47% less likely to develop dementia than those with negative age beliefs (Levy et al., 2018¹²).

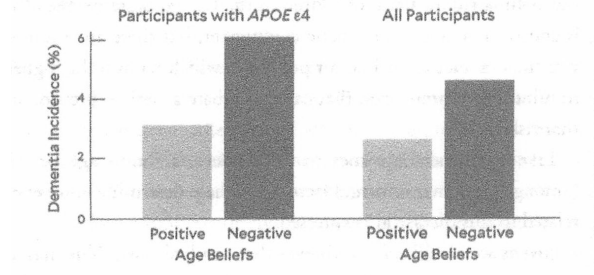


Figure 2: Positive Age Beliefs Reduce Risk of Dementia. These beliefs reduced the risk of dementia for all participants, including those with the risky gene APOE ε4.

I drew much of the above material from a book titled *Breaking the Age Code* by Becca Levy (2022, New York: Harper Collins Publishers. ISBN: 978-0-06-305317-5.) Though I have highlighted studies from that book that make a very strong case that having positive beliefs about aging benefits us in many ways, Levy's book has much more to tell, like how our beliefs affect our perceptions, exploring various negative myths about aging, and crucially, how we might change our beliefs if they happen to fall on the negative end of the spectrum.

Levy also addresses the idea of wisdom of the aged as something that many societies and cultures, past and present, have depended on. Examples like recall of cultural knowledge or even strategies for survival, especially in hard times; sources of knowledge – think of our many docents and community elders who share their knowledge and skills; and experienced craftspeople and other workers who teach younger ones. Levitan (2020)¹³ mentions physicians

¹¹ Levy et al. (2002) longevity increased by positive self-perceptions of aging. *Journal of Personality and Social Psychology* 83:261-70.

¹² Levy et al. (2018) *PLOS ONE* 13:e191004.

¹³ Levitan (2020) *Successful Aging*. New York: Penguin Random House Publisher.

and scientists over 60, whose experience has made them better at pattern recognition. He provides as an example that you would rather have a 70-yr-old radiologist read your X-ray than a 30-yr-old one! Older adults use a wider neural network when processing certain kinds of information and more often use both hemispheres. Though sometimes slower, that can result in greater flexibility. Levitan's book, *Successful Aging*, which explores much of these cognitive changes, is a wonderful read, too!

Here's a poem by Longfellow that I came across years ago, that I think bears witness to the heart and essence of positive age beliefs.

It is too late! Ah, nothing is too late
Till the tired heart cease to palpitate....
Chaucer, at Woodstock with the nightingales,
At sixty wrote the Canterbury Tales;
Goethe at Weimar, toiling to the last,
Completed Faust when eighty years were past...
What then? Shall we sit idly down and say
The night hath come; it is no longer day?...
Something remains for us to do or dare:
Even the oldest tree some fruit may bear;...
For age is opportunity no less
Than youth itself, though in another dress,
And as the evening twilight fades away
The sky is filled with stars, invisible by day.

We all must age, despite the multi-billion-dollar industries trying to sell us anti-aging creams and various devices and supplements and special diets and so on. And, we do develop arthritis and cataracts and many, many other challenges – there is no doubt about that and no minimizing the impact. **How we age is part our biology, but also part how we and our society think about aging.** Even if you can change only your own set of beliefs about aging, you will benefit and grow. Even if you have learned that you have viewed aging negatively, you have a brain capable of plasticity. So come up with positive words and activate a positive belief about aging. See how it spreads!

