Brain Morsels: Packet 12

The last pillar: Social engagement

And tying it all together, too.

A social scenario, or two

Let's imagine yourself meeting a friend for a walk. Let's add that this is a long-time friend with whom you haven't been able to spend much time recently, and you have missed him. You see him as you get out of your car in the parking lot near the river path, and wave, pleased to see him. But something seems off.

Another situation. You are due to attend a gathering of some 30 or so people who have been working on a project together for many months. It's all going well though of course there have been challenges, expected and unforeseen alike. You're a bit tired, but you want to attend anyway. Tonight one of the leaders will be talking about some issues that have come up that might affect the project. You enter the room and begin to take stock.

What is the brain doing in such social situations? And why is social engagement a key in maintaining brain health as we age?

Thinking about these from the perspective of the brain rapidly reveals that social engagment is an extremely complex task, even under familiar circumstances. We've talked before about brain networks, or circuits, which connect different functional areas of the brain. Activating those areas together gives rise to a higher-order process or capability that in turn allows us specific thoughts, responses, and behaviors. The greater the complexity of the network's task, the greater the likelihood that the network will engage many different areas of the brain. Social engagement demands operation of most of the brain's higher-order networks.

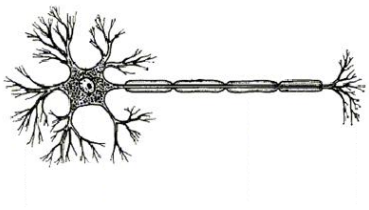
Very briefly, which networks are likely to be involved? You've met some of them before. There's an *attention network* that allows us to focus on salient stimuli and to pivot attention to a new or unexpected stimulus. There's a *language network*, a *sensory-motor network* including especially subnetworks for vision and hearing, an *emotional network (the limbic system)*, a *central executive network* that functions as a regulatory network in support of goal-directed operations including social relationships, a *salience network* that selects external stimuli to which we should pay attention and recruits other networks that are relevant to the task at hand, and finally the *default mode network* that seems inwardly directed in its cognitive tasks (e.g., remembering, mind-wandering). Reviewing the two scenarios described earlier quickly reveals that almost all of these networks will be active and that means that most regions of the brain will be active.

Returning to the first scenario…
You know that something is wrong. How did you know that? Visual, attention and salience networks: he is not standing as tall as usual nor is he walking as rapidly toward you as would be typical for him. As you approach, you notice that he smiles, but not a full smile. His energy seems low. Language, hearing, attention and emotional networks: He's a good friend and you are sensitive to what and how he responds to you. Central executive, emotional, and language networks: Thinking about how to be supportive. And so on.

In the second scenario…
As you walk in, your attention is differently focused than in the previous one. This is a more formal situation. Most likely, your first assessment is of the tenor of the room (visual, hearing, salience, attention, and language networks). What are you there to do, to find out (central executive network, salience, and attention networks)? Where are the people with whom you most frequently associate (sensorimotor, salience, and attention networks)? If the presentation turns out to be hopelessly boring, but you would be remiss to leave, you might sit and day-dream a bit - and that's the default mode network. Is there something at play that was unexpected, and perhaps quite stressful (emotional, attention, language, salience and central executive networks and all of the parts of the brain that are activated in response to stress, including for example, those regions that modulate heart and respiratory rate)?

In short, **social engagement fully engages the brain**, deep brain exercise if you will. Or think of it as a neural choreography that allows the interaction among the networks that makes social engagement and community possible. We have evolved to be social creatures, whether we are introverts or extraverts or something in between. Which is to say that **the brain thrives when it is socially connected.**

https://www.flickr.com/photos/teosaurio/10137846884



<u>Why are so many elders disconnected from meaningful connections?</u>
Well, there are many potential reasons and they commonly interact in an individual with other factors that make social connections harder. Some have withdrawn because of sensory deficits - too much background noise to hear others at the table, or poor vision, especially at night, making forays away from home harder. For some, mild cognitive issues have made conversations difficult to follow or make the person feel stupid so social interactions are

avoided. For others, chronic medical conditions limit time and energy for social engagement. For some, poor mobility is the issue. For others, friends have moved or passed away. Children are grown and busy, too far away or unsupportive. Maybe a move away from a familiar home or community has left a person feeling untethered and anxious. Or the neighborhood no longer feels safe. Some elders just sort of drift into isolation and loneliness.

Research is absolutely clear that social connections often are lost early for many reasons and that loss diminishes us (V. Murthy (19th US Surgeon General) (2023); Y. Luo, et al. (2012)[1]. Brain health declines, we enjoy life less and chronic loneliness can set in, often triggering a slide into depression and even increasing mortality risk. Chronic loneliness affects social and emotional brain networks making individuals more sensitive to negative emotions and making them less responsive to positive encounters. Even if a person just perceives themselves to be lonely, the effects can be stressful and contribute to poor physical and mental health (Cornwell & Waite (2009)[2]). Remember the effects of chronic stress on both the body and the brain. More cortisol, more adrenaline. The amygdala, which triggers our fight-or-flight response and modulates our emotional reactions, is hyperactive. A consequence is that the world seems more dangerous, making it harder, of course, to find ways to re-engage. Our pattern-seeking brains begin to detect more and more evidence that the world is a negative place, perpetuating loneliness.

Elders with small networks, or none, have shorter life spans (Y. Ren et al. (2023)[3]). In a study with more than 300,000 subjects over 7 years, researchers found a 50% increase in the likelihood of staying alive if the individuals were actively engaged and connected; BUT for those isolated and alone, they also found a 30% increase in risk of cardiovascular disease like heart attacks and stroke, increased risk of suicidal ideation and behavior, and a 50% increase in risk for cognitive decline and dementia (cited in J. Karp (2022)[4]. Loneliness has clearly been shown to trigger the activation of pro-inflammatory genes (D. Levitan (2020)[5]), which we already have seen to have a negative effect on brain health. This would be an instance of nurture (whatever has led to loneliness) triggering an aspect of nature (activation pro-inflammatory genes), the two combininig to increase the risk of both physiological and emotional dysfunction. Loneliness also increases the risk of depression, which again increases dementia risk.

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[1] V. Murthy (2023) *Together: The healing power of human connection in a sometimes lonely world*. NY: HarperCollins. ISBN: 978-0062913302; Y. Luo et al. (2012) *Loneliness, health, and mortality in old age: a national study.* Social Science and Medicine 74: 907-914.

[2] E Cornwell & L Waite (2009) *Social disconnectedness, perceived isolation and health among older adults*. Journal of Health and Social Behavior 50:31-48.

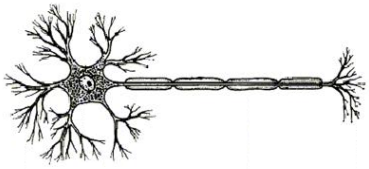
[3] Y. Ren et al. (2023) *The impact of loneliness and social isolation on the development of cognitive decline and Alzheimer's Disease.* Frontiers in Neuroendocrinology Vol 69. https://doi.org/10.1016/j.yfrne.2023.101061

[4] J. Karp (2022) https://www.youtube.com/watch?v=xnydkNMVL2A

[5] D. Levitan (2020) *Successful Aging.* NY: Dutton. ISBN: 9781524744182

These 'socially frail' individuals are more likely to be weak physically, be slower in general and less active, and experience weight loss. Those conditions in turn increase the risk of falls, hospitalization, admission to a nursing home, poor surgical outcomes, and earlier death (J. Graham (2023)[6]). In short, **being socially frail comes with significant health risks for older adults, leaving them far less resilient physically and mentally**.

Are some elders particularly vulnerable socially? Absolutely! Unmarried individuals, especially those over 85, those with less education and lower income, and men in general are at greater risk as are those who are living alone[7]. The most vulnerable are members of marginalized groups and those who are geographically isolated, often in rural communities with limited resources and little or no access to public transportation.



Activity: Assessing your own social network

1) Think of your own social network. How many friends do you have (network size)? How close are they, not in the geographic sense, but in knowing each other well and being available to assist if a problem arises or for simply bouncing ideas around? Are there others around you with whom you share interests and ideas? Especially if you are not very mobile, do you have someone available to drive you places or check on you or simply visit? Do you live alone? Do you talk to someone each day? What do you do to participate socially? Do you use social media like Facetime or Zoom to connect with friends and family? Do you use the internet to explore, for news, to keep a sense of being connected to the world at large? Are you lonely (this could happen even if you seem to be very connected)? Do you have a good marriage? How about your sexual life (partnered sex is very social after all, even if physical intercourse is not possible anymore)? Could you be depressed and lack the energy and motivation to engage socially? Are the darker and shorter days of winter especially hard for you?

[6] J. Graham (Mar 21, 2023) *Being 'socially frail' comes with health risk for older adults.* Kaiser Health News. KFFhealthnews.org.

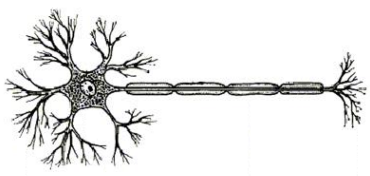
[7] E Cornwell & L Waite (2009) *Social disconnectedness, perceived isolation and health among older adults*. Journal of Health and Social Behavior 50:31-48; J. Karp (2022) https://www.youtube.com/watch?v=xnydkNMVL2A

2) How is your hearing? Do you need or have hearing aids? If your hearing is poor, do you take advantage of headsets or the loop mode for your hearing aid that is increasingly available at theaters and churches? At home do you use a Bluetooth-enabled headset that will allow you to adjust sound level via your hearing aids independent of the volume of the TV (thereby sparing your family from stressful high noise levels)? As an alternative or adjunct, have you set-up closed captioning?

3) Do you spend too much of your time on the internet or on social media? Of course the resources of the internet are immense and can be the source of much enjoyment and learning. Similarly social media can keep you connected with family and friends. But too much time on either can be addicting and isolating, creating the conditions for anxiety and depression. Social media simply cannot substitute for in-person interaction.

We all experience periods of loneliness but **chronic loneliness among elders is becoming a significant public health problem**. We spend less time physically engaging with others than ever before. What can we do to turn that around? Whether you are an introvert or an extravert, to the extent of your ability, nurture connections. Do something that will bring you in contact with others regularly, whether that be though a class, a group that engages in activities you enjoy and that gives you common ground for conversation, a volunteer effort that gives purpose and meaning to your life, or simply meeting with friends. *In-person whenever possible!* In-person, where you can deploy all your senses, engage the power of touch (Packet 7), and feel fully connected. And yes, use media to stay connected if in-person is just not possible. Whatever is at the root of loneliness for someone, the brain has that critical capacity to rewire – neuroplasticity! Loneliness need not be a permanent state.

One last thought. There is almost a glaring omission in our discussion so far, which is that, at its best, social connection centers in love. Both biology and religions urge social connection. In addition to all the network activity you can imagine, biologically, the brain also releases the hormone oxytocin, which drives us to seek each other out, especially family and friends, when there is stress around us. Core to most of the world's great religions is loving one another. Hopefully we all know the power of love that connects and values us, accepting us for ourselves. We experience love in that shared cup of tea that helps prop our resilience, the hand that reaches out, pulling us to a sense of safety or at least shared experience, to say you are not alone.



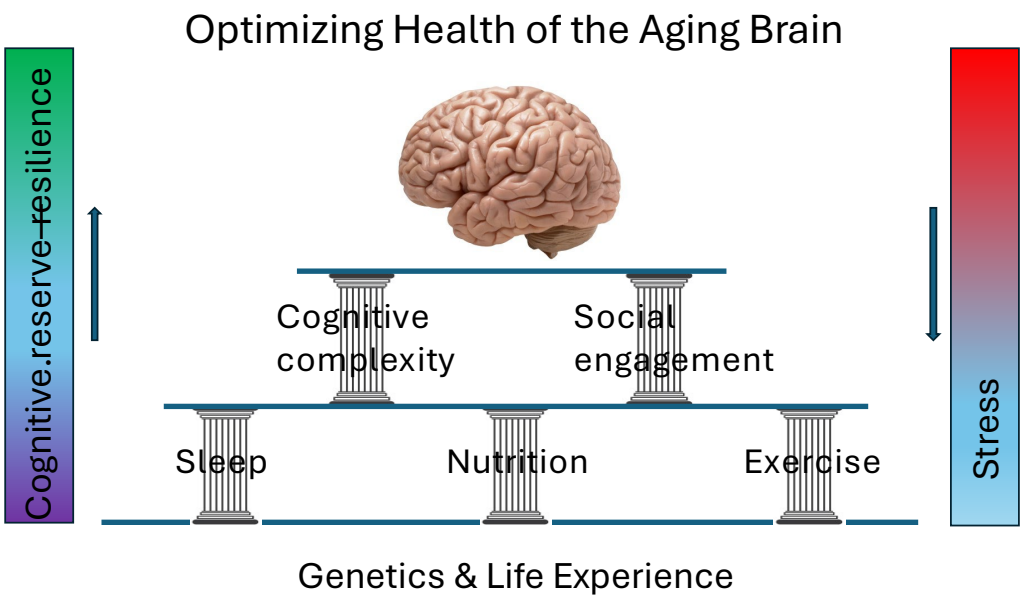
Tying it all together: The pillars supporting brain health as we age

In the beginning….
Your embryonic nervous system was constructed in accord with your genetic code. Neurons were born and deployed molecular sensors that let them migrate to the right place, and then to extend their processes – the dendrites and axons that are so characteristic of neurons. The neurons first connected locally and then began to form networks across the brain. Eventually that rudimentary framework became active and began to have enough power to detect and respond to external stimuli. From this point on, the developing nervous system is shaped by experience – neuroplasticity in action.

Who you are now reflects your life experiences. Those experiences, which themselves are molded by culture, education, income, health, level of stress, and the environment, are encoded in the very fabric of your brain, in its synapses and networks. Your path through life has brought you to this moment, and you are still weaving your life's tapestry, still creating your story.

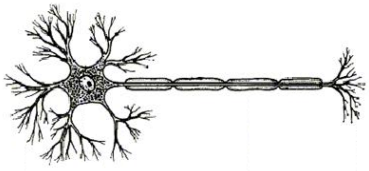
Aging is a developmental stage as surely as are infancy, childhood, and adolescence. Each stage requires us to build on the previous ones, using the knowledge, skills and emotional capabilities gained earlier to learn, to thrive, to change, and to adapt to the conditions we now face. We now know that:

- As we get older there can be significant changes in brain structure and function, especially after 70 years.
- **But**, those changes don't happen to everyone and when they do, there is huge variability in how extensive the changes are.
- Many factors affect how the brain changes as we age. Some of those we have some control over, especially all the conditions affecting cardiovascular health.
- Stress can be countered by learned coping strategies, which contribute to our resilience. The context in which we operate can matter a lot – familiar and structured context is less demanding, easier. Controlling stress and building cognitive reserve allows us to use the gift of neuroplasticity to optimize brain health.
- Aging well is supported by *all* the pillars of brain health – exercise, sleep, nutrition, cognitive complexity, and social engagement. The strength of each pillar affects the strength of the others.



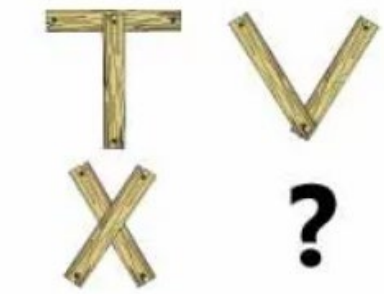
And, remember that everyone ages differently!

There is no one way to age successfully.

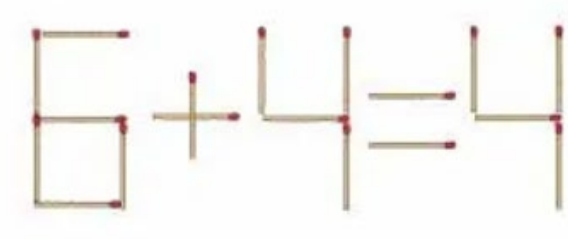


Puzzles

Puzzle 1. What other letters would fit in this set?



Puzzle 2. Move 1 match to make the equation correct.

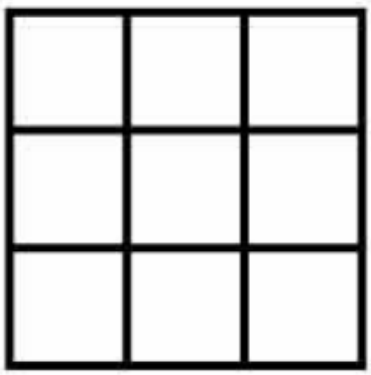


Puzzle 3. If it takes 12 $1 stamps to make a dozen, how many $1.50 stamps does it take to make a dozen?

Puzzle 4. What are the next two letters in the sequence?

ON, DJ, FM, AM, JJ, ??

Puzzle 5. Place the numbers 1 to 9 in the boxes so that each row of 3 adds to 15.



Puzzle 6. The following words are all about gems and jewelry. Unscramble the letters to discover the words.

a. s p i e r p a h
b. i o h s t e t n r b
c. d n i o d m a
d. e l m d r e a
e. c r l y t s a
f. i p s a l
g. r a a t c
h. r e u b s i
i. b m a r e

Note: All but the last puzzle comes from ESLvault.com.

Answers on the following page

Answers

Puzzle 1. The letters “L” and “y”. Each of the letters in the set comprises 2 segments connected at one point.

Puzzle 2. Move the vertical matchstick in the plus sign to make the 6 into an 8. Then 8-4 = 4.

Puzzle 3. It still takes 12. A dozen is a dozen.

Puzzle 4. “AS”. The set starts with the months October November (ON), so the last pair in the sequence is August September (AS).

Puzzle 5.

1 5 9
6 7 2
8 3 4

Puzzle 6.

a. sapphire
b. birthstone
c. diamond
d. emerald
e. crystal
f. lapis
g. carat
h. rubies
i. amber