



Brain Health and Mental Well-Being:

GCBH Recommendations on
Feeling Good and Functioning Well

Global Council on
Brain HealthSM
A COLLABORATIVE FROM AARP

“One, remember to look up at the stars and not down at your feet. Two, never give up work. Work gives you meaning and purpose and life is empty without it. Three, if you are lucky enough to find love, remember it is there and don’t throw it away.”

— Stephen Hawking, providing guidance on life in an interview with ABC’s Diane Sawyer, June 2010. The renowned scientist known for making complex physics understandable to the general public died at age 76 on March 14, 2018, the day our meeting concluded.

Background: About GCBH and Its Work

The Global Council on Brain Health (GCBH) is an independent collaborative of scientists, health professionals, scholars, and policy experts from around the world who are working in areas of brain health related to human cognition. The GCBH focuses on brain health relating to people's ability to think and reason as they age, including aspects of memory, perception and judgment. The GCBH is convened by AARP with support from Age UK to offer the best possible advice about what older adults can do to maintain and improve their brain health. GCBH members gather to discuss specific lifestyle issue areas that may affect people's brain health as they age, with the goal of providing evidence-based recommendations for people to consider incorporating into their lives.

We know that many people across the globe are interested in learning the ways in which one can maintain their brain health as they age. We aim to be a trustworthy source of information, basing recommendations on current evidence supplemented by a consensus of experts from a broad array of disciplines and perspectives.

Mental Well-Being and Brain Health

On March 13 and 14, 2018, members of the GCBH met at the Age UK head office in London to examine the impact of mental well-being on brain health in adults age 50 and older. Throughout the discussion, experts examined the evidence on how mental well-being can influence the cognitive abilities of people as they age. Participants are listed in appendix 1.

This paper summarizes the consensus reached by the experts and describes the major points of discussion that led to their recommendations for men and women age 50 and older.

It also identifies gaps in our knowledge about mental well-being and brain health, provides a glossary of terms used in the document, and lists resources for additional information. This paper is not intended to be a systematic, exhaustive review of all pertinent scientific literature on the topic. Rather, the selected references provided at the end of the document give helpful background material and present a sizeable sample of the current evidence underpinning the GCBH consensus in this area.

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Introduction

The GCBH agreed that mental well-being is related to people's brain health as they age. Poor mental well-being (e.g., pessimism, not feeling useful) may interfere with people's abilities to think and reason, as well as how they interact with others and how they regulate their emotions. For example, studies of older people in the United Kingdom and Germany have linked greater mental well-being to better cognitive health. (See selected references in appendix 10.) Long-term studies from the United States and Israel have also connected greater mental well-being to reduced dementia risks later in life. Because mental well-being is a potentially modifiable factor that people can take steps to improve, the GCBH wanted to address the current scientific consensus around this topic so that adults could learn what they might do for better brain health. For the purpose of this report, and in the absence of a universally accepted definition, we have defined mental well-being below.

Mental well-being – people's experiences of feeling good, functioning well and coping adequately with life circumstances and challenges.

Mental illness – short- or long-term mood, thinking, and behavior disorders or related symptoms that are severe enough to interfere with people's activities, work, and relationships.

During the drafting of this report, AARP Research surveyed 2,287 American adults age 18 and older about their perceptions of their own mental well-being and brain health¹. This survey demonstrates an interesting relationship between individuals' perceptions of their mental well-being and their self-reported memory and thinking skills. While the survey can't establish cause and effect, the survey found that adults age 50 or older who scored higher on the scale of mental well-being tended to report better memory and thinking skills. (See more about these findings in the discussion below.)

This survey also examined the various ways adults coped with their life stresses and what coping strategies appeared

to be most helpful to them in maintaining mental well-being. The results helped inform the practical tips suggested by the GCBH as active steps people should consider incorporating into their lives to promote mental well-being. The results are described below in greater detail in the discussion.

This report aims to:

1. Provide greater understanding of the relationship between mental well-being and brain health.
2. Provide practical recommendations and tips on feeling and functioning better in order to promote brain health as people age.
3. Provide some coping strategies on how to handle stress, anxiety, and depression as people age, recognizing there are people who experience such significant degrees of these issues that they may need medical advice. We do not provide medical advice for mental illness. But we do include some information to help people understand the difference between experiencing poor mental well-being and potentially experiencing mental illness, which requires medical evaluation and professional mental health treatment.

It's important to note that the science behind how mental well-being is connected with brain health is not very well developed. Designing research that assesses whether mental well-being affects brain health is challenging for a number of reasons further explained below, but this report relies on the best studies and evidence to date. While the available evidence suggests a relationship between better mental well-being and better brain health, we are not able to definitively determine if one causes the other. In other words, it's somewhat like that age-old question: Which comes first, the chicken or the egg? While we may not know which comes first, the GCBH's recommendations and practical tips suggested for adults to maintain and improve their mental well-being are based on the current state of the science and are consistent with what we do know may help foster better brain health.

1. 2018 AARP Brain Health and Mental Well-being Being Survey: An online survey fielded May 15-June 1, 2018, among a nationally representative sample of 2,287 Americans age 18+. plus. For more details, see appendix 9. For selected slides and data from the survey, see figures 1-11 in appendix 11.

CONSENSUS STATEMENTS

These consensus statements and the recommendations that follow are based on sources and research within psychology (clinical and social), adult and old-age psychiatry, cognitive neuroscience, epidemiology, and psychopharmacology (with greater emphasis placed on human studies), including several large well-designed observational studies. The results of such studies were published in peer-reviewed journals. Randomized controlled trials (RCTs)—which are designed to show cause and effect—have not been used as often in social science research as they have been in other areas of brain health study. There are not many large, well-established RCTs specifically relating to mental well-being and cognition in older adults. Implementing RCTs in this area is particularly challenging because of the complexity and the scale such studies would require, and length of long-term follow-up needed, as well as ethical considerations. Instead, scientists studying the connection between mental well-being and cognitive function have largely relied on epidemiological research studies, which are typically observational in nature. Definitions of the terms used in the consensus, recommendations, and practical tips are provided in the discussion sections and attached glossary in appendix 2. This report focuses on what older adults can do to modify their own mental well-being, and not on all the social or biological determinants of well-being.

1. Mental well-being is a person's own experience of feeling good and functioning well.
 - a. Feeling good is the self-judgment of life satisfaction, which often consists of feeling comfortable, healthy, happy, or purposeful.
 - b. Functioning well includes not only the ability to think and reason sufficiently to conduct activities of daily living, but also the ability to function socially with others and to cope with life circumstances and challenges.
2. Good emotional control and social cognition—the ability to relate well to others—are key components of mental well-being.
3. Some cognitive skills that come with age and experience (e.g., improved regulation of negative emotions) can be beneficial to mental well-being. Aging is associated with decline in some cognitive abilities, but also includes an upward trend in mental well-being after middle age.
4. It is possible to maintain mental well-being even if you experience declines in your cognitive abilities or physical health.
5. Mental well-being is more than the absence of mental illness.
6. There is a complex relationship between mental well-being and brain health:
 - a. Genetics, environmental factors (including the physical and social atmosphere in which a person lives), social factors such as loneliness, early life experiences, personality, and relationships with other people affect mental well-being.
 - b. Attitudes of individuals as well as the society they live in affect mental well-being during aging, and negative attitudes towards aging can contribute to a sense of a burden of old age.
 - c. Cultural factors (values, beliefs, history) influence how people define and achieve mental well-being.
7. Greater mental well-being is associated with reduced dementia risks.
8. Experiencing the full range of emotions is part of the human experience, but too much negative emotion and stress (e.g., situations which exceed your capabilities and are not within your control) is bad for both mental well-being and cognitive health.
9. Taking multiple medications (without careful evaluation of their interactions by a healthcare professional) can have adverse effects on mental well-being and cognitive health.
10. Regardless of how old you are, you can take steps to improve your mental well-being such as engaging in a purposeful activity (e.g., volunteering) and living a healthy lifestyle (e.g., regular exercise, eating a balanced diet).

2. Randomized controlled trials and epidemiological observational studies are defined in the Glossary in appendix 2. An overview of the differences, strengths and limitations of the two study types in humans is listed in appendix 4.

EXPERT RECOMMENDATIONS

We believe the following suggestions will increase the chances for people to experience or optimize mental well-being. If you are already engaging in these healthy activities, continue to do so, and consider trying something new as well.

FOR INDIVIDUALS:

1. Take the time to develop and strengthen relationships with family and friends. For more about the brain health benefits of strong social ties, see the GCBH report, [The Brain and Social Connectedness: GCBH Recommendations on Social Engagement and Brain Health](#).
2. Spend time outdoors to regularly appreciate and enjoy nature.
3. Develop or strengthen your feeling of having a purpose in life.
4. Honor your feelings. Acknowledging and accepting positive and negative emotions is vital to mental well-being.
5. Identify enjoyable activities (e.g., hobbies, exercise) that can lift your mood even when you are down.
6. Come to peace with your past decisions and acknowledge what you cannot change.
7. Accentuate the positive, even during illness, distress, or frustration.
8. Engage in regular exercise to benefit the body and mind. If you don't currently exercise, start with walking or water aerobics, but also consider playing sports, lifting weights, hiking, and swimming. For more information about the brain-health benefits of exercise, see [The Brain-Body Connection: GCBH Recommendations on Physical Activity and Brain Health](#).
9. Avoid repetitively going over the same issues or problems (harmful rumination) by learning to quiet negative excessive thoughts. Distract yourself with music or reading, confide in friends, set time limits, challenge the repetitive thought, see recommendation 10,11.
10. Try a mindful movement practice such as yoga or tai chi and/or start a meditation practice, such as deep breathing alone or with others.
11. If you are under chronic stress, look for ways—through exercise, meditation, yoga and/or therapy—to relieve the mental and physical effects of stress.
12. Get seven to eight hours of sleep at night, and optimize the quality of your sleep. For more practical tips on getting good quality sleep, see [The Brain-Sleep Connection: GCBH Recommendations on Sleep and Brain Health](#).
13. Beware of medications that are linked to an increased risk in anxiety, depression and trouble sleeping. Regularly review all your medications—including vitamins and supplements—with your doctor or health care provider.
14. Consult a doctor or mental health professional if you think you may suffer from anxiety or depression.
15. Work with a doctor to manage conditions such as diabetes and heart disease that can be detrimental to brain and overall physical health.
16. Avoid excessive alcohol. If you do drink, drink in moderation.

FOR COMMUNITY ORGANIZERS:

1. Encourage group activities and collective work, especially volunteering.
2. Provide opportunities for people to meet with each other in social settings and encourage them to befriend those who have difficulty getting out and about.
3. Give purpose to people's lives by encouraging participation in programs that help others and in ways that are emotionally rewarding.
4. Consider the benefits of intergenerational social interactions when planning activities.
5. Foster improvements in the physical and social atmosphere of long term care facilities.

PRACTICAL TIPS

- 1. Look for activities you enjoy.** Regularly doing something that makes you feel good is important for your mental well-being. Below we have included a number of suggestions for actions to try or lifestyle choices to make, but it's important to find activities that appeal to you.
- 2. Seek out meaningful connections with others in your community.** Start by getting to know your neighbors. The 2018 AARP survey found that the more often adults age 50 and over socialized, the higher their mental well-being scores.
- 3. Aim to get enough high-quality sleep.** Maintain a regular schedule where your sleep/wake hours do not fluctuate, and avoid watching TV in bed. Stay away from all digital screens before bedtime. Studies have found that the LED light emitted by digital screens may prevent the brain from releasing the sleep hormone melatonin. (For more tips on getting good sleep, see the GCBH Brain Sleep Connection report).
- 4. Eat healthy foods.** Experiment with different fruits, vegetables, and healthy proteins to create a healthy diet. The 2018 AARP survey found that men and women age 50 and over who reported eating more nutritious and well-balanced meals also had higher mental well-being scores than those who said they rarely ate nutritious meals. (For detailed information on nutrition and brain health, see the [GCBH Brain Food](#) report.)
- 5. Find opportunities to exercise, particularly outdoors.** Explore green spaces in your neighborhood and community, including state and national parks. Also, try gardening. Digging in the dirt can be a great way to relieve stress, get exercise, and promote mental well-being.
- 6. Become a regular volunteer in the community.** Those who volunteer tend to have less anxiety, depression, loneliness, and social isolation, as well as a sense of purpose in life. The 2018 AARP survey found that adults age 50 or older who volunteer at least once a year have higher mental well-being scores than those who don't volunteer at least once a year. Consider taking a leadership role in a group or organization of which you are a part.
- 7. Learn new things by yourself or with others.** Find an interesting topic and learn as much as you can about it at your local library. Take a course at a community college, through Osher Lifelong Learning Institutes, Senior University or University of the Third Age in Europe. Or try out one of the many free or inexpensive online courses. Rekindle hobbies that brought you joy as a youngster, or consider trying a new hobby.
- 8. Express gratitude.** Begin or end your day by thinking of things for which you are grateful. Consider keeping a gratitude journal. Research finds that gratitude reduces depression and anxiety, lowers stress and increases happiness and empathy.
- 9. Practice the art of forgiveness.** Positive psychology research has found that forgiving oneself and others promotes life satisfaction and self-esteem.
- 10. Set aside 15 minutes each day for yourself.** Use this time to meditate if you can. This can involve sitting quietly for a few minutes and focusing on taking deep, calming breaths. There are smartphone apps and web pages for guided meditation that can help.
- 11. Discover or re-join a faith-based group to explore your spirituality.**
- 12. Consider joining a choir or singing group, or attend a symphony or choir series.** Music can be a powerful mood lifter.
- 13. Look for things that make you laugh.** Explore humorous movies, books, or online videos. Laughter triggers the secretion of "feel good" hormones such as endorphins, dopamine, and serotonin, which can relieve stress and reduce tension and anxiety—even lessen pain.
- 14. Take breaks from e-mail and social media.** Consider turning off notifications. Put your smart phone in another room and turn off the volume to help focus on a task. Consider checking social media (Facebook, Instagram, etc.) on a schedule and avoiding smart phones during meals.
- 15. Declutter your life.** Donate old clothes and books that no longer bring you pleasure. Clean out closets. Toss old magazines and catalogs. Throw away or shred mail, bills, and letters that you don't need.
- 16. If you are drinking more than a moderate amount of alcohol, cut back.** Moderate consumption is defined by the GCBH as generally one drink per day for women and two drinks per day for men. (See the [GCBH Brain Food](#) report.)
- 17. Do not be afraid to seek help from a health professional if you have concerns about your mental health.** Conditions such as anxiety and depression are common and can be treated.

DISCUSSION

Process used to produce the consensus and recommendations

Issue specialists from around the world, representing leaders in their fields, were invited to participate on the GCBH panel on Brain Health and Mental Well-Being. These experts have conducted research that has significantly contributed to the body of evidence linking mental well-being with brain health in older adults. Their diverse areas of expertise represent perspectives from disciplines including psychology, psychiatry, geriatric psychopharmacology, social psychology, clinical epidemiology, psychotherapy, and neurology.

Issue specialists from five different countries were asked to critically examine the state of the science as of March 2018. Because there are so few randomized controlled trials on mental well-being and its effect on brain health, they focused the discussion on their professional experiences and findings from short- and long-term observational studies. The experts considered the cumulative body of evidence to determine whether it is sufficient to issue recommendations on mental well-being with the aim of helping individuals to maintain and improve brain health. The issue specialists considered 12 different questions as a framework to guide their deliberations. The complete list is available in appendix 3.

After an in-depth moderated discussion, several follow-up conference calls and an exchange and refinement of drafts, the issue specialists arrived at 10 consensus statements to summarize the impact of mental well-being on the brain health of older adults. Based on their consensus, they made numerous recommendations related to mental well-being in the context of brain health and cognitive decline. Further, they agreed on 17 practical tips to help people around the world adopt behaviors to maintain optimal brain health as they age.

Numerous liaisons from civic and non-profit organizations with relevant expertise in brain health were invited to provide input and technical feedback during the refinement of the draft recommendations.

Three Governance Committee members participated in the meeting in London. The entire Governance Committee reviewed and finalized the document during subsequent meetings, conference calls, and emails between March 2018 and August 2018. The Governance Committee members issuing the recommendations are independent health

professionals representing diverse expertise across three continents in epidemiology, psychology, public health, neurology, psychiatry, geriatrics, cognitive neuroscience, neuropsychology, pharmacology, medical ethics, health policy, and neurodegeneration.

Governance Committee members applied their expertise to determine whether they concurred with the statements and to evaluate the objectivity and feasibility of the proposed recommendations. The GCBH Governance Committee reviewed this summary document to decide whether it accurately reflected the expert opinions expressed and the current state of science in the field. The Governance Committee approved the document on October 3, 2018.

Guiding principles underlying the expert consensus and recommendations

Science and knowledge of brain health are continually evolving. These recommendations are based upon the current state of scientific and medical knowledge in order to provide people with reliable information and guidance on what is known and not yet understood about the relationship between mental well-being and brain health for adults age 50 and older. As we noted above, while there is not definitive evidence that improving mental well-being will necessarily lead to better brain health, findings to date suggest that people can take proactive steps to better manage life's challenges that come as we age. The GCBH feels confident in making these recommendations for people to incorporate into a healthy lifestyle in order to help maintain and improve mental well-being and possibly their brain health. These recommendations are generally designed for adults without neurodegenerative disease or mental illness. While we are hopeful that people can follow at least some of the practical tips and recommendations above, we acknowledge that taking some of the recommended actions could be challenging to adopt for those already experiencing poor mental health. Therefore, the recommendations provide a variety of different steps to choose from that may appeal to different people, and are not set forth in any particular order of priority.

The core components of mental well-being

Scientists have developed several ways to examine mental well-being in the general population. The Organization for Economic Cooperation and Development (OECD)

defines well-being as “good mental states, including all of the various evaluations, positive and negative, that people make of their lives and the affective reactions of people to their experiences.” Within such broad, inclusive definitions are multiple components that permit researchers to conceptualize mental well-being along emotional, cognitive, psychological, and social experiences. For example, happiness and life satisfaction may lead to emotional well-being; good relationships and the ability to effectively manage day-to-day responsibilities can lead to psychological well-being. These well-being concepts are often inter-linked through personality traits, life experiences, and access to support, and it is not always possible to individually test the relationship between each well-being concept and brain health.

At the same time, it is useful to have a standardized framework to assess well-being as people, governments, and other organizations try to improve individuals’ well-being through programs and policies. Expert panels convened by the OECD, the US National Institute on Aging, and the UK Economic and Social Research Council proposed three main subtypes of well-being important to measure: the satisfaction with one’s own life as a whole (life evaluation or evaluative well-being), the positive and negative emotions felt by a person (affective or experienced well-being), and the feeling of having a purpose or meaning in one’s life (eudaemonic well-being). Even though the experts emphasized that some components of well-being often co-exist and can even overlap, such a framework helps scientists, sociologists, economists, and policy-makers develop a common language of well-being across languages and cultures.

The different scales of measuring mental well-being reflect these as well as other themes in well-being. The Warwick Edinburgh scale is one of several well-validated, frequently used tools in Europe and the United States to study mental well-being in the general population. AARP has used this scale in most of its recent studies relating to brain health, including for the one done in conjunction with this report. The seven elements of mental well-being identified in this scale are people’s perceptions of:

1. self-acceptance (i.e., feeling good about self),
2. positive relationships (i.e., feeling close to other people),
3. environmental mastery (i.e., dealing with problems well),
4. purpose in life (i.e., feeling useful),
5. personal growth (i.e., feeling more mature or independent),
6. vitality (i.e., having energy to spare),

7. optimism (i.e., feeling positive about the future)

While some of the traits assessed by this scale can be influenced by your genetic profile as well as the environment in which you live, most of these elements can be shaped by changing your own attitudes and behaviors. Therefore, taking steps to have a positive impact on these factors by implementing helpful lifestyle choices gives you the potential to improve your brain health as you age.

Cognitive function and mental well-being in AARP brain health survey

During the drafting of this report, AARP Research surveyed 2,287 American adults age 18 and older about their mental well-being and brain health. As we said earlier, this survey is not designed to determine cause and effect, but it does demonstrate an interesting association between individuals’ mental well-being and their self-reported memory and thinking skills. While we don’t know whether having better memory and thinking promotes better mental well-being or vice versa, the survey found that adults age 50 or older who scored higher on the scale of mental well-being tended to report better memory and thinking skills. (See Figure 1 in appendix 11) It also showed that the higher they rated their memory and thinking skills, the higher their mental well-being scores tended to be. A positive, significant relationship was found between cognitive function and mental well-being. These findings are consistent with other research that has found an association between mental well-being and cognitive function. Within the area of memory, the questions focused on two types of recall. One is the ability to remember things such as names, dates and grocery lists, sometimes called episodic memory. The other is the ability to do things like take medications, pay bills, and follow recipes, sometimes called executive function. The survey found that in both types of memory, those who rated their cognitive function as excellent or very good also tended to rate their mental well-being higher than those who said their memory was average, fair or poor. Interestingly, the largest difference was in how people rated their mental sharpness. Those who said they had poor brain health and mental sharpness reported a nearly 16-point difference in mental well-being from those who said their brain health was excellent or very good. So the sharper they felt they were, the higher their average mental well-being score. (For information on survey methodology, see appendix 9.)

Purpose in life and brain health

Several studies have directly examined the roles played by optimism and life purpose in brain health. One of these is the United States Health and Retirement Study. Researchers have found greater optimism, positive attitude, positive affect, life satisfaction, and purpose in life associated with reduced risks for dementia. However, when all these concepts of mental well-being were examined along with socioeconomic, psychological, and genetic factors, purpose in life was the strongest predictor of better brain health. Having a purpose was associated with a 20 percent reduction in dementia risk in the Health and Retirement Study. It was further linked to reduced risks for mild cognitive impairment and dementia in a group of 900 community-dwelling older persons in the Chicago area. These and other studies lead to the recommendation for adults to develop and strengthen a sense of purpose in life. The GCBH also addressed the importance of feeling purpose in life to maintaining cognitive health in an earlier report: *The Brain and Social Connectedness: GCBH Recommendations on Social Engagement and Brain Health*. This report described the Experience Corps program which provides a sense of purpose and meaningfulness for older adults volunteering 15 hours a week in schools. Studies of this service project designed to improve elementary school children's academic performance and develop their life skills demonstrated that it also led to improvements in the adults' brain health. In fact, the study showed for some of the male volunteers increases in the volume of their hippocampus — an area of the brain crucial to memory — and improvements in the volunteers' cognitive function.

Lifestyle choices that have been shown to improve mental well-being

Although making lifestyle changes can be difficult, especially for those who aren't already experiencing feelings of mental well-being, small steps count. Ways that may improve mental well-being include socializing with others, exercising regularly, practicing mindfulness, spending time in nature, getting good sleep, and carefully monitoring your medications. We discuss some of these in greater details below.

Spending time with friends and beloved family members can help combat negative emotions and stress. Even in the absence of negative emotions and crisis, GCBH previously concluded in *The Brain and Social Connectedness* that “the weight of evidence suggests that social engagement helps maintain thinking skills and slows cognitive decline in later life.” It may take some time and effort to strengthen and develop relationships, but research shows that regular and purposeful social connections can benefit both your physical and mental health while social isolation harms both. Some studies show that dementia is more common among older

adults who are socially isolated, and less common where social supports are available.

Exercise and regular physical activity can also help relieve feelings of stress, depression, anxiety and troubling emotions. The GCBH previously found in *The Brain-Body Connection* that purposeful exercise and regular physical activity have a positive impact on brain health. Making regular exercise part of your routine may equip you with the knowledge and ability to use exercise as a tool to help improve mental well-being even if you are feeling down.

Some interventions aimed at promoting mental well-being through mindfulness are derived from ancient contemplative practices. While the origins of mindfulness trace back to Asian communities, mindfulness is a topic of increasing study in the global medical and scientific community. Across cultures and religions, the science evaluating the elements of mindfulness finds that it can often help to improve mental well-being.

Mindfulness has two components (1) being present in the moment, and (2) observing what's happening in your life without engaging in a problem-solving mode. The ability to be mindful has been shown to increase life satisfaction, in part because people feel better able to deal with life's issues, and it can also improve mood.

Mindfulness is a concept that crosses borders, but ways to achieve mindfulness differ according to culture and region. Yoga is considered by many to be a form of meditation or mindful movement. Several randomized controlled trials—considered the gold standard for medical research—have found that yoga may improve mental well-being in physically inactive older adults. However, these studies included relatively few people. Yoga has also been recommended in the treatment of depression, anxiety and insomnia, and in practice has shown promising results. Mindfulness meditation is another strategy used in treatments for depression, anxiety and chronic stress. A few randomized controlled trials have found it to improve mental well-being, potentially by helping people regulate their emotions when stressed.

Japanese forest bathing, or *shinrin-yoku* — being in the presence of trees—has been trending in the news as a way to lower heart rate and blood pressure and reduce stress hormone production, but spending time in nature or green spaces has long been recommended to improve mental well-being. The ancient Indian concept of creating a harmonious 100-year life suggests spending the third stage (around the ages 50 to 75) living in a forest as part of a contemplative, tranquil lifestyle called “vanprasth” (life as a forest dweller). Some research has found that walking in nature, as opposed

to walking in urban environments, may help people manage stress, calm rumination and regulate emotion. A number of studies have found that green spaces and parks in cities are linked to positive mental health, but the research hasn't discovered exactly why or if other factors—such as income levels—may influence those findings.

Getting adequate amounts of sleep is important to have and maintain mental well-being as you age. The GCBH previously found in *The Brain-Sleep Connection* that getting seven to eight hours of sleep each night can help maintain brain health as people age. A 2016 AARP survey on sleep and brain health found that 43 percent of adults age 50 and older in the United States reported not getting enough sleep. The GCBH's report on sleep noted that those with chronic inadequate sleep are at higher risk for depression, dementia and a number of other illnesses. While poor mental well-being can sometimes result in poor sleep quality, optimizing sleep hygiene, quality, and duration will help you better manage feeling down or stressed.

People generally take more medications as they age for management of chronic health conditions, but multiple medications can interact with each other in ways that are detrimental to mental well-being. For example, medications can interact to amplify side effects, including sleep problems, mental grogginess, anxiety, bouts of depression, and mood instability. This can especially be true if you get medications from multiple healthcare providers. It's important to regularly discuss your medications—including vitamins and herbal supplements—with a health care provider who knows you well.

Negative emotions differ from mental illness

Any in-depth discussion on mental well-being invariably touches on the distinctions between negative emotions and mental illness. The GCBH notes that its recommendations are intended to improve mental well-being and are limited to helping older adults cope better with negative emotions, such as sadness, anxiety or stress; the recommendations are not intended for the treatment of mental illness, which requires medical care.

The following chart provides examples of common feelings of sadness, anxiety, and stress associated with lack of mental well-being, and shows how they differ from feelings that might require medical evaluation and treatment for mental illness. While all people may not be able easily fit themselves in one box or another, the chart describes the two ends of the spectrum of feelings.

Negative emotions	Signs of possible mental illness
Feeling sadness about something specific (e.g., missing out on a promotion)	Feeling depressed and hopeless in general, losing interests in things you used to enjoy; may affect self-care and relationships
Feeling worried about something specific (e.g., speaking in public)	Feeling unusually heightened anxiety over your routine or a particular event; may affect self-care physical health and relationships
Feeling stressed over specific events or people (e.g., kitchen remodeling)	Feeling overwhelmed or powerless over small things; may affect self-care, physical health and relationships

Feelings of sadness, anxiety, and stress are common at all life stages; they are not unique to aging. The impact on the individual depends on the feeling's triggers, intensity, and duration. Acute triggers can refer to a single traumatic event such as the death of a loved one or being present during a terrorist attack. Chronic triggers are things like dealing with a long-term illness or living through a war. These feelings can elicit a series of short- and long-term downstream effects on an individual's neuroendocrine stress-response systems. Some people will have acquired certain skills to manage (not necessarily eliminate) these negative emotions, while others prone to these feelings can still learn coping strategies.

In contrast, persistent negative emotions that interfere with work, relationships, and self-esteem can signal the onset or recurrence of mental illness. Signs of mental illness need to be evaluated by medical professionals. Appendix 4 includes a self-assessment patient health questionnaires that can help people identify if they may need professional mental health evaluation and treatment.

Stress, resilience, and mental well-being

There is no clear way to tell good stress apart from bad stress. Each person has different life experiences, stress responses, problem solving skills, and access to resources. The same stressor that makes one person stronger may irreversibly harm another.

Implementing one or more of the stress-reduction and coping strategies that are outlined above in the recommendations and practical tips can have a positive effect on mental well-being. People who manage stress effectively most or all of the time report significantly higher mental well-being scores than those who rarely or never manage their stress effectively, according to the 2018 AARP survey. (Figure 2, appendix 11) The survey also found that adults age 50 or older who

frequently managed stress effectively were more likely to rate their cognitive functions as “excellent” or “very good.” (Figure 3, appendix 11)

In the face of life circumstances and challenges, individual differences come to bear as people cope with stress and adversity as they age. In mental well-being research, the ability to deal with problems well, and to subsist or even thrive in adversity is called environmental mastery.

A particularly important part of environmental mastery for people as they age is resilience, or the capacity to recover quickly from difficulties. Studies in stress neurobiology and psychology have shown the importance of resilience in aging. However, mental well-being is more than just resilience, and people can enhance mental well-being by self-acceptance and other strategies even when resilience fails. Risk, resilience, and self-acceptance thus interact within a framework of many social, physical and environmental factors that together contribute to mental well-being.

There are many choices a person can make to try to manage his or her lifestyle in order to improve mental well-being. However, there are many structural, social determinants outside an individual’s control that they need to resiliently cope with in order to foster a sense of well-being. This is one reason acknowledging what you cannot change is also an important component to achieving mental well-being.

Personality traits and mental well-being

Certain personality traits such as optimism are considered important components of mental well-being. While people sometimes think of personality as fixed throughout life, research on people’s traits from early childhood to late life has only shown a modest stability for two traits: openness/extroversion and conscientiousness. For example, in the Six Day Sample (Scotland) which assessed self and others’ perceptions of dependability across 63 years, greater conscientiousness at age 14 is related to conscientiousness at age 77. These researchers also found a positive relationship between conscientiousness and mental well-being, so children who score high on the conscientiousness scale may be more likely to experience better mental well-being in old age. Other personality traits tend to change in the more positive direction during aging. For example, self-confidence – which is related to self-acceptance in mental well-being – gradually increases over decades, especially after people reach their 30s. Because mental well-being has multiple components, the development of more positive personality traits may contribute to the observation that overall mental well-being increases after mid-life, despite age-associated increases in illnesses and life transitions.

Conversely, negative personality traits can reduce mental well-being. Neuroticism has been identified in the literature as the most important trait that negatively affects mental well-being. Individuals with a neurotic personality are prone to guilt, anger, and anxiety. They also tend to have difficulty forming and maintaining relationships. Because most personality traits are not fixed, early and effective management of anger and anxiety could improve mental well-being. A recent meta-analysis of clinical interventions shows that personality can be changed. The research found that psychotherapy and other behavioral interventions can affect personality.

Early life stress influences mental well-being and the brain

Mounting research has shown that early life experience is critical to shaping one’s physical and psychological trajectories over the lifespan. Early significant, adverse life experiences can render people vulnerable to mental illness during childhood or later in life. Exposure to higher levels of stress hormones, such as cortisol, tracing back to the womb can have long-lasting ‘programming’ effects on brain development and mental well-being. Studies tracking individuals over time have found that exposure to elevated levels of stress hormones during pregnancy can in effect rewire the developing brain and stress response pathways in the baby with the impact lasting into adulthood and later life.

Early-life psychological stress has been shown to affect brain function during adulthood and later life. While much of literature to date has looked at the more immediate impact of early life experience on cognitive function, a number of studies have examined the delayed consequences of early life adversity in later life. The hippocampus, a region of the brain associated with long-term memory storage, has been reported to show progressive deficits in function during late adulthood following early-life stress. The relationship between negative early-life stress and greater amyloid-related changes has been corroborated in a number of mouse models of Alzheimer’s disease. At the same time, certain forms of more positive early-life stress may instead elicit some protective mechanisms. For example, in mice genetically engineered to have brain changes consistent with Alzheimer’s disease, early brief removal of pups from their mothers improved maternal care upon reunion and decreased the amount of Alzheimer’s changes in the hippocampus. Therefore, it’s possible that positive and negative stress in early life can impact an individual’s brain health later in life but human research on this relationship is in early stages.

Age-related transitions influence mental well-being

There are challenges in aging associated with periods of transition as people age. It is normal to experience bereavement as family members and friends pass away. Feelings of grief and bereavement are normal in these circumstances. Feelings of loss may also surface when it comes time for retirement (mandatory in some countries). People also experience frustration and sadness when they lose markers of independence such as the ability to drive. It is normal to feel sad in these situations, and people who have the ability to adapt to changing life circumstances and experience may more quickly resume more normal feelings and states of mental well-being. However, prolonged bereavement is not part of the normal response to these transitions. If cognitive impairment accompanies the bereavement, the individual should seek help from a health professional.

Happiness and perceptions of mental well-being improve with age

Despite feelings of loss that often occur as people age, getting older does not necessarily mean people are less happy. In fact, on average, the opposite is true. Numerous studies have found that people report greater mental well-being as they age past their mid-50s into the later stages of their lives. This tendency to report high levels of happiness and well-being around the ages of 18 to 21, declining through young adulthood and mid-life with significant increases starting around age 50 is often described as a U-shaped curve of happiness over the lifespan, meaning that people tend to be happier when they are younger and older but have a decrease in happiness during midlife. Some research has found different patterns across different countries. The recent AARP survey also found an increase in mental well-being with age (Figure 4, appendix 11). In addition, the AARP survey shows that adults age 50 or older who have a more positive view of aging have significantly higher average mental well-being scores (Figure 5, appendix 11). These results complement previous research that has found a link between positive attitudes about aging and good mental well-being and cognitive health. A number of studies have also found a “positivity effect” of aging, meaning that older adults tend to remember and pay attention to positive information more than negative information, compared with younger adults.

Culture influences mental well-being

Cultural beliefs, values, and traditions play a critical role in shaping perceptions of mental well-being. Expressions and reactions surrounding mental well-being vary across cultures and socioeconomic backgrounds. For example, mental

distress is more likely to be expressed as a physical problem (i.e., as a bodily ailment, such as abdominal pain, headache or fatigue) than as psychological distress in Chinese or East Asian cultural contexts. Perceptions about what constitutes mental well-being vary across cultures and socioeconomic backgrounds, just as perceptions of changes in cognition, aging, death and the importance of individual autonomy vary by culture. The relative importance of each one of the seven elements outlined in the Warwick-Edinburgh Mental Wellbeing Scale described above will differ according to the culture and environment in which people live. For example, older adults in one region of the world may believe that experiencing positive relationships is more important to their well-being than personal growth if that region values social interdependence more than it values individual independence. Therefore, the recommendations above suggested to individuals to improve well-being are wide-ranging, so that they may be used and applicable amongst a wide variety of different cultures. There are resources that are targeted towards improving mental well-being in specific populations.

Although it is clear that the socioeconomic conditions in which people live affect their mental well-being, recommendations in that area are generally beyond the scope of this report. While we primarily focus on what individuals can do to affect their own well-being, we note that there are programs developed in many countries and languages to promote older adults’ emotional and mental well-being in community settings. Some of these programs have been rigorously evaluated, and have evidence demonstrating effective stress reduction and improvements in symptoms of anxiety and depression. For example, Calmer Life is a community-based outreach and treatment program for underserved, low-income, mostly minority older adults in Houston, Texas, with serious worry. Serious worry is worry about everyday problems that happens often and is hard to control. It may make people feel restless, tired, or tense. Compared with other older adults, those adults with serious worry are more likely to have poor physical health, and they often have depression and sleep problems. They are also more likely to have trouble thinking clearly. People in the study received up to 12 training sessions for three months to learn healthy ways of thinking and acting. They also learned how to get help with needs such as food or housing. Social workers and Community Health Workers matched trainings to each adult’s needs. They included religion or spirituality if requested. The trainers followed up by phone every month for another three months. After six months, participants showed statistically and clinically significant reductions in worry and anxiety.

Where you live affects your mental well-being

The human brain is shaped in part by the environment in which people live. The impact of urbanization on mental well-being and mental illness is well-established. Currently 55 percent of the world's population live in urban areas, and that is predicted to increase to 68 percent by 2050, according to the United Nations. City dwellers are at an increased risk for anxiety disorders and mood disorders. People born and raised in cities have an increased incidence of schizophrenia, but there may be other factors involved in this finding beyond urban dwelling. Some research has linked the urban environment's impact on well-being with social stress, while other research has found that air pollution has a negative effect on well-being.

To combat the effect of urban environments on mental well-being, we suggest following the recommendations and practical tips listed earlier in this document. It may be especially helpful to spend time in green spaces. Research has found that spending time in nature—even urban parks— can help buffer the harmful effects of stress in urban environments.

Late-life depression and dementia

Multiple studies have shown that severe depression in older people with normal memory is associated with increased risk of developing dementia within a few years. Because we now understand that Alzheimer's and related diseases can begin to develop 15 to 20 years before the memory loss symptoms of the disease are obvious, it is unlikely that depression leads to rapid-onset Alzheimer's disease. Therefore, it's possible that in some people late-life depression is one of the early signs of Alzheimer's disease. Sometimes, it can be difficult to distinguish between certain aspects of depression and mild memory loss in normal aging and disease. Most clinicians agree depression symptoms should be treated through medications or non-pharmacological approaches regardless of whether Alzheimer's disease is present.

Study limitations in mental well-being and stress neurobiology research

There are limitations in the types of clinical trials and studies that can be conducted in the field of mental health due to ethical considerations. Ethical considerations limit the use of chronic or acute stressors in a prospective study. Researchers therefore heavily rely on animal studies to assess the relationship between stress and mental well-being and use brief laboratory experimental stress inductions in humans. They also rely on studies on humans in the field that are retrospective in nature. For example, studies that have tracked the development of individuals raised in orphanages are able to shine light on the impact of early life experience (and in many cases deprivation) on long-term mental well-being. Other studies examine the impact of daily stressors on well-being and how this unfolds over hours, days, weeks, and years. So while we acknowledge there are not as many randomized control trials in this area of brain health research as in others the GCBH has studied, other types of valuable scientific inquiries and analysis help us meaningfully assess the relationship of mental well-being to brain health.

KNOWLEDGE GAPS: WHERE MORE RESEARCH IS NEEDED

There are numerous areas where more research is needed to better understand the impact of mental well-being on brain health in adults. As mentioned earlier in the discussion, well-being is an umbrella term that covers several distinct but related components, and it is often hard to consistently measure complex emotional responses and internal processes between individuals. Some components of well-being also involve long-term personality traits, and how they change according to age, individual exposures (e.g., marriage, parenthood), and collective experiences (e.g., war, famine) cannot be easily characterized. Researchers have developed new approaches to expose people to pleasant and unpleasant experiences (e.g., virtual reality), and these have the potential of testing each person's resilience and well-being for correlation with short-term markers of stress and long-term brain health.

While there is significant literature connecting socioeconomic status and mental well-being, additional research into this relationship and how to positively impact mental well-being, particularly in lower-resourced areas, would be valuable.

Further, there are important sex differences, with women being more likely than men to suffer from conditions such as anxiety or mood disorders and dementia, yet women have a greater life expectancy than men. We are only beginning to understand contributing factors of this double gender gap, with metabolic and endocrine factors, with metabolic and endocrine factors likely playing a role.

Post-traumatic stress disorder (PTSD) and traumatic brain injury may directly or indirectly affect mental well-being and cognitive aging. Researchers are investigating these conditions' psychological and physical effects on the brain, including how re-emergence of PTSD in late life may be associated with a decline in cognitive capacity. Future work will be necessary to determine how to optimize mental well-being in these conditions.

Studies have noted anxiety as a risk factor for cognitive decline including a newly published 12 year follow-up study. Further studies addressing worry or anxiety treatment to prevent neurodegenerative disease should be considered. Other researchers have noted the potential value in studying early identification and treatment of depression as a way to lower the risk for dementia.

There have been small randomized controlled trials (RCT) aimed at improving one's feeling of purposefulness in people with diseases not affecting the brain; similar studies can test whether having a purpose will improve mental well-being and cognitive functioning in people with mild cognitive impairment (MCI) or dementia. Some scientists have speculated that the placebo effect observed in many clinical trials has to do with the participant feeling purposeful (e.g., contributing to medical science, helping others), and so newer study designs are necessary to account for this prominent and persistent effect.

CONCLUSION

Finding ways to incorporate the recommendations and practical tips outlined in this report into your daily life will help you to take a more active role in managing your brain health by optimizing your mental well-being. Mental well-being cuts across many of the topics that the GCBH has addressed to date. Each of the lifestyle choices adults make regarding exercise, sleep, dietary habits, alcohol consumption and levels of cognitive and social engagement have been linked to mental well-being. Therefore the recommendations made in each of the previous GCBH reports listed in Appendix 8 are also helpful. Just as people have good days and bad days when it comes to physical well-being, the same is true of mental well-being. Fluctuations in mental well-being are to be expected. This report strives to help people understand what they can do to cope with the typical ups and downs associated with daily life. Importantly, we also aim to empower our readers to consult with mental health professionals if their mental well-being is a cause of concern.

As further developments occur in the study of the impact of mental well-being on brain health, the GCBH will periodically revisit these recommendations and provide updates when appropriate.

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List of Additional Resources

Information about World Mental Health Day (10 October) from the World Health Organization: http://www.who.int/mental_health/world-mental-health-day/en/

Well-being research from the OECD: Measuring well-being and progress: <http://www.oecd.org/statistics/measuring-well-being-and-progress.htm>

WHO Information Sheet on mental health in the workplace: http://www.who.int/mental_health/in_the_workplace/en/

Strategic trends, research and analytics. World Economic Forum: <https://www.weforum.org/agenda/archive/mental-health>

Advice to improve mental wellbeing from Age UK: <https://www.ageuk.org.uk/information-advice/health-wellbeing/mind-body/mental-wellbeing/>

Information about the Calmer Life Program on the U.S. Department of Veterans Affairs website: <https://www.mirecc.va.gov/visn16/calmer-life-program.asp>

For a list of lifelong learning institutes at colleges and universities, see http://www.osherfoundation.org/index.php?olli_list

Information about MQ, an international charity dedicated to transforming mental health through research: <https://www.mqmentalhealth.org/>

For assistance with chronic disease self-management, see the Self-Management Resource Center, available at <https://www.selfmanagementresource.com/about/>

*Participation in this activity by these individuals does not necessarily represent the official viewpoint of the U.S. Department of Health and Human Services, the National Institutes of Health, or the National Institute on Aging.

2. GLOSSARY

The glossary highlights how the GCBH used these terms within the context of their discussions and in this document.

Ageism. The stereotyping and discrimination against individuals or groups on the basis of their age; ageism can take many forms, including prejudicial attitudes, discriminatory practices, or institutional policies and practices that perpetuate stereotypical beliefs.

Anxiety. Apprehensive uneasiness or nervousness. In severe cases can result in a mood disorder where the person experiences extreme worry or nervousness about people, challenges, or events when there is little or no reason for that level of concern.

Brain health. A state of having good underlying neural mechanisms to support mental processes of cognitive function that support well-being and activities of daily life.

Cognitive decline. The Institutes of Medicine in the United States defined a similar term, cognitive aging, as the lifelong process of gradual and ongoing, yet highly variable, change in cognitive functions that occur as people get older. Cognitive decline is a term used by the experts to describe losing cognitive abilities over time as people age absent a specific disease or condition.

Cognitive function: a process by which a person becomes aware of, perceives or comprehends ideas. It involves all aspects of perception, thinking, reasoning, and remembering. *(Derived from Mosby's Medical Dictionary, 9th edition.)*

Cognitive health: the ability to clearly think, learn, and remember.

Confounder. A situation in which the effect or association between an exposure and outcome is distorted by the presence of another variable.

Connected. To experience a sense of belonging and welcomed in a group.

Coping. The conscious effort to reduce stress.

Daily living activities (*Activities of Daily Living – ADL*). An umbrella term that refers to activities or tasks that people undertake routinely in their everyday life, including self-care.

Dementia. Dementia isn't a specific disease. Instead, dementia describes a group of symptoms related to memory, thinking and social abilities and affecting them severely enough to interfere with independent daily functioning. Though dementia generally involves memory loss, memory loss has many different causes. Many types of dementia are progressive and irreversible. Alzheimer's disease is the most common cause of dementia in older adults, but there are a number of types of dementia. Depending on the cause and type of dementia, some dementia symptoms can be reversed.

Depression. A common but serious mood disorder where one feels severe sadness and dejection.

Emotional control. A facet of emotion regulation, but refers primarily to attempts by an individual to manage the generation, experience, or expression of emotion, and/or one's emotional responses.

Empathy. Empathy involves an understanding of another person's world by listening to allow a better understanding of the other person's situation, and by responding with verbal and non-verbal messages that communicate affective understanding of that person's situation. Cognitive empathy refers to the ability to recognize and interpret the other person's situation while affective empathy refers to an accurate emotional expression of that person's situation.

Epidemiological studies (*which can be cross-sectional or longitudinal*).

In longitudinal studies, which are observational in nature, scientists try to establish a link between lifestyle activities (e.g., education) and long-term outcomes (brain health with aging).

Happiness. A range of positive emotions, including joy, pride, contentment, and gratitude.

Intervention. Any measure or activity that is designed to improve health or an outcome to alter the course of disease or condition.

Loneliness. A feeling a person experiences as a result of the gap in the connection with others between what the person want and what they have.

Longitudinal studies. In longitudinal research, scientists observe changes over time to establish the time-sequence in which things occur or the effect of a factor over time.

Meaning. There are three components in personal meaning: (1) cognitive component, which is about making sense of one's experiences in life, (2) motivational component that is about pursuit and attainment of worthwhile goals, and (3) affective component that is about feelings of satisfaction, fulfilment, and happiness accompanying goal and attainment.

Mental health. A state of mind characterized by emotional well-being, good behavioral adjustment, relative freedom from anxiety and disabling symptoms, and a capacity to establish constructive relationships and cope with the ordinary demands and stresses of life. *(APA Dictionary of Psychology)*

Mental well-being. People's experiences of feeling good, functioning well and coping adequately with life circumstances and challenges.

Mindfulness. Awareness of one's internal states and surroundings. (*APA Dictionary of Psychology*)

Mindfulness meditation. A type of meditation in which a person focuses attention on his or her breathing and in which thoughts, feelings, and sensations are experienced freely as they arise. Mindfulness meditation is intended to enable individuals to become highly attentive to sensory information and to focus on each moment as it occurs. (*APA Dictionary of Psychology*)

Personality traits. The five major characteristics that make up a person's personality. Each individual varies in degree of openness, conscientiousness, extraversion, agreeableness and neuroticism.

Plasticity. The ability to change and adapt, especially the ability of the central nervous system to acquire alternative pathways for sensory or motor skills. (*The American Heritage Medical Dictionary*)

Randomized Controlled Trial (RCT). In a typical randomized controlled trial, people are randomly selected to receive either the intervention or a control condition. In a double-blind trial, both the participants and the researchers are unaware of (or "blinded" to) which person received the intervention until after the results are analyzed.

Resilience. The process of adapting well in the face of adversity, trauma, tragedy, threats or significant sources of stress.

Risk. Risk is the chance or probability of a particular event happening in a group of people with similar characteristics or traits, compared with those not having that characteristic or trait. Making up an individual's overall risk of having a condition is the cumulative effects of factors that increase the chance of developing the condition (risk factors) as well as factors that decrease the chance of developing the same condition (protective factors).

Risk reduction. Reducing risks for cognitive decline or impairment in the abilities to think, reason, and remember means lowering your chances of experiencing loss in those abilities. A person's overall risk may also be reduced by increasing factors that protect against cognitive decline or dementia. Dementia (due to Alzheimer's disease or another related disorder) is one condition, and cognitive decline (the slowing of thinking and memory in the absence of a major brain disease) is another condition. When scientists study risk reduction strategies for cognitive decline, they are looking for factors that can reduce the risk of impairment to cognitive functions in the population in general. Therefore, some activity or intervention that reduces risk for a particular condition or disease means that a smaller proportion of people who engage in that activity are likely to have the condition or disease. However, risk reduction strategies are not the same as preventing any one individual from getting the condition or suffering from disease. For example, research has long shown that wearing a seatbelt reduces – but does not eliminate – the chance of injuries among people who are involved in automobile accidents and we nevertheless now recommend people wear seatbelts while they are driving.

Social cognition. A term used to describe cognitive processes related to the perception, understanding, and implementation of linguistic, auditory, visual, and physical cues that communicate emotional and interpersonal information. Like other cognitive and human problem-solving abilities, social cognition is associated with the integrity of interrelated brain systems for accurate perception and interpretation of the behaviors of others and the effective emotional and behavioral response to those behaviors. (*From: WAIS-IV, WMS-IV and ACS*)

Stress. The physiological or psychological response to internal or external stressors. Stress involves changes affecting nearly every system of the body, influencing how people feel and behave. For example, it may be manifested by palpitations, sweating, dry mouth, shortness of breath, fidgeting, accelerated speech, augmentation of negative emotions (if already being experienced), and longer duration of stress fatigue. (*APA Dictionary of Psychology*)

Well-being. Self-evaluation of life satisfaction often described as the state of being comfortable, healthy, or happy.

3. DISCUSSION QUESTIONS FRAMING THE DELIBERATIONS

1. The GCBH defines 'brain health' as the mental process of cognition including the abilities to think, reason, learn, remember, concentrate, use judgment and plan. How would you define 'emotional well-being' for the purpose of our report?
2. Does emotional well-being promote healthy cognitive aging? Can we be precise about the over-arching relationship between 'emotional well-being' and 'brain health'? We know that this question will not be easy because the putative inter-relationship is likely to be reciprocal. (That is, does pathology precede the experience of emotional well-being or do psychological factors influence the development of pathology).
3. How does 'emotional well-being' change over the life course? What is the relationship between age, 'brain health', and 'emotional well-being'?
4. What role do personality factors play in the 'well-being – brain health' relationship?
5. How do attitudes toward aging impact emotional well-being? How does 'purpose in life' affect 'emotional well-being'? How do career changes or retirement affect 'emotional well-being' and 'brain health' in older age?
6. Describe how brain health in old age is affected by low-level chronic stress or severe stressful events. In what way do chronic versus acute stressors impact an individual? What are the differential effects? How does resilience factor in and how can an individual improve resilience?
7. Are there elements unique to urban versus rural environments that play a role in handling stress well?
8. Does 'emotional well-being' affect the process of brain plasticity? How so? Is this due to ageing or other factors (e.g. genetic, epigenetic, environmental etc.)?
9. What impact do clinical conditions have on emotional well-being and brain health?
10. What emotional well-being coping strategies do you suggest for those living with dementia, MCI, or other brain-related diseases? Are there strategies you would not recommend?
11. Little appears in health messages about nourishing and sustaining the supporting structure of the brain. How important is this with regard to emotional well-being and what health messages should we emphasize?
12. What part do polypharmacy, single drug effects and interactions play in individual's well-being and their ability to cope with depression, stress, anxiety or apathy?

4. PATIENT HEALTH QUESTIONNAIRES

The PHQ-9 and Q7 questions are tools to assess depression. The Generalized Anxiety Disorder 7 Item Scale (GAD7) questions are tools to assess anxiety. Q18 is a tool to assess feelings of purpose in life.

PHQ-9

Over the last 2 weeks, how often have you been bothered by any of the following problems? (circle the number for each question)

	Not at all	Several days	More than half the day	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself – or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

(Total Score ____ = ____ + ____ + ____)

Q7

Depression Scale – CES-D	
Please tell me how strongly you agree or disagree with the following statements.	
1. Rarely or none of the time (less than 1 day)	2. Some or a little of the time (1-2 days)
3. Occasionally or a moderate amount of time (3-4 days)	4. Most or all of the time (5-7 days)
• I did not feel like eating; my appetite was poor.	• I was happy.
• I felt that I could not shake off the blues even with help from my family or friends.	• I talked less than usual.
• I felt I was just as good as other people.	• I felt lonely.
• I had trouble keeping my mind on what I was doing.	• People were unfriendly.
• I felt depressed.	• I enjoyed life.
• I felt that everything I did was an effort.	• I had crying spells.
• I felt hopeful about the future.	• I felt sad.
• I thought my life had been a failure.	• I felt that people disliked me.
• I felt fearful.	• I could not get going.

GAD-7

Over the last 2 weeks, how often have you been bothered by any of the following problems? (circle the number for each question)

	Not at all	Several days	More than half the day	Nearly every day
1. Feeling nervous, anxious or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

	Not at all	Several days	More than half the day	Nearly every day
8. Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

(Total Score _____ = _____ + _____ + _____)

Q18

Purpose (Meaning in Life)			
Please tell me how strongly you agree or disagree with the following statements.			
1. Disagree strongly	2. Disagree	3. Agree	4. Agree strongly
<ul style="list-style-type: none"> I have a system of values and beliefs that guide my daily activities. 		<ul style="list-style-type: none"> In my life, I have clear goals and aims. 	
<ul style="list-style-type: none"> I have a philosophy of life that helps me understand who I am. 		<ul style="list-style-type: none"> I have a sense of direction and purpose in life. 	
<ul style="list-style-type: none"> I feel like I am living fully. 		<ul style="list-style-type: none"> I feel good when I think of what I have done in the past. 	
<ul style="list-style-type: none"> I feel I have found a really significant meaning in my life. 		<ul style="list-style-type: none"> I am at peace with my past. 	

5. DIFFERENCES, STRENGTHS AND LIMITATIONS OF TWO STUDY TYPES IN HUMANS

	Epidemiological Studies	Randomized Controlled Trials
Purpose	To observe a group of people in their natural surroundings (often over extended periods of time), and to identify personal characteristics, behaviors, and conditions which predict someone's chance of developing a condition or a disease.	To determine, in a controlled setting, whether implementing a change (in behavior, diet, medication, etc.) can definitively lead to a specific outcome. This compares those engaging in an activity with those not engaging in the activity.
Example	Researchers who survey and follow 6,800 men and women aged 50 to 89 in a long-term study on aging in England ask for self-reported sexual activity over past 12 months and then test these participants on word recall and number sequencing.	Researchers at a University Medical Center wish to recruit 450 people age 60 or older from 12 senior centers to sing in a choir for a year, be interviewed by the study staff before and during the trial and complete several health assessments. The control group would need to be similarly situated seniors from the senior centers who do not participate in the choir but are interviewed and assessed on the same factors.
Study duration	Years to decades	Weeks to months, sometimes years

	Epidemiological Studies	Randomized Controlled Trials
Strengths	<ul style="list-style-type: none"> • Usually larger number of people • Can take into account influences from many more factors and personal characteristics and disease states • Can assess many dose levels and durations of behavior. 	<ul style="list-style-type: none"> • Helps to prove causal link and to better understand mechanisms • Randomization can eliminate many competing hypotheses as to why the change actually happened (because confounding factors have an equal probability of occurring in all groups).
Strengths (cont.)	<ul style="list-style-type: none"> • Can detect slow or cumulative changes over time • Where observational studies are representative of the population, they have greater external validity which means that the findings can be applied to a wider range of people. 	<ul style="list-style-type: none"> • Can test whether different doses of an intervention (e.g., exercise frequency, drug dose) can lead to different outcomes. • Uses detailed and objective measurements and assessments.
Limitations	<ul style="list-style-type: none"> • Does not prove any specific causal link. • May not capture all characteristics which influence health. • Any characteristic may reflect another more important factor (e.g., people who take expensive medications may have better access to health care). • Selective drop-out of those less socially advantaged and less healthy. • Difficult to generalize from one region to another due to differences in diet, environment, healthcare, etc. • Often cannot collect detailed information due to the large numbers of participants and measures. • Expensive to set up and run, especially over long periods. • Some studies rely on self-reported behavior which may be inaccurate. • People who volunteer to participate in a study to be followed for long periods of time may have particular characteristics leading to bias in the sample. 	<ul style="list-style-type: none"> • Usually smaller number of people. • While an RCT attempts to control for confounding factors, it may not capture all characteristics which influence health. • The study may be too limited in size or duration to detect subtle effects. • Difficult to test conditions which scientists cannot change (e.g., gender, genetics, past exposure) • Difficult to generalize from one region to another due to differences in diet, environment, healthcare, etc. • In smaller RCTs, outcomes can be biased by accidental inclusion of people who are much more or much less likely to respond to the intervention. • Effects are restricted to defined dose and intervention type. • RCTs usually have very strict inclusion and exclusion criteria so the samples are often unrepresentative and results cannot be as widely generalized. • Attrition rate during the course of the RCT could bias the results. • Outcome reporting bias can influence results in which primary outcomes are changed, introduced or omitted since the original protocol. • Short time frame limits capacity to examine long term interventions which is particularly relevant for lifestyle changes that may lead to small, cumulative effects over years and decades such as physical activity.

6. DISCLOSURE STATEMENT OF POTENTIAL FINANCIAL CONFLICTS OF INTEREST

All of the 19 GCBH experts participating in the formulation of this paper were asked to disclose potential conflicts of interest. Eighteen of the experts who participated in the meeting and contributed to the formulation of the recommendations attested they had no conflicts of interest. One of the experts disclosed ongoing relationships which have the potential to raise perceived financial conflicts of interest involving for-profit companies. Dr. Ronald Petersen declared part-time consultation with several pharmaceutical companies. These disclosures are available upon request by contacting staff of the Global Council on Brain Health.

7. FUNDING

AARP and Age UK provided the funding and staffing for the convening of the consensus meeting, conference calls and formulation of this consensus and recommendation paper. AARP and Age UK paid for the travel costs associated with attending the in-person meeting and provided modest honoraria for the experts participating in the meeting March 12-14, 2018 and for the participation of the Governance Committee members in conference calls. Liaisons did not receive reimbursement or honoraria.

8. LIST OF PAST GCBH REPORTS

[The Brain–Body Connection: GCBH Recommendations on Physical Activity and Brain Health](#)

[The Brain–Sleep Connection: GCBH Recommendations on Sleep and Brain Health](#)

[The Brain and Social Connectedness: GCBH Recommendations on Social Engagement and Brain Health](#)

[Engage Your Brain: GCBH Recommendations on Cognitively Stimulating Activities](#)

[Brain Food: GCBH Recommendations on Nourishing Your Brain Health](#)

9. 2018 AARP SURVEY ON MENTAL WELL-BEING AND BRAIN HEALTH METHODOLOGY

An online survey fielded May 15-June 1, 2018 among a nationally representative sample of 2,287 Americans age 18+.

Objectives: To explore the relationship between stress, coping styles, mental health measures, and routine activities

Methodology: Online, nationally representative survey via GfK KnowledgePanel, with sample targeting panelists age 18 or older. All estimates are for the general 18+ US population unless otherwise noted.

Sample: GfK KnowledgePanel, N=2,287.

Oversample: Additional interviews were conducted to achieve the following samples:

- a. 352 Hispanic/Latinos age 18+ (conducted in both English and Spanish)
- b. 356 African Americans age 18+
- c. 203 Asian Americans age 18+

Weighting: The data were weighted by age, gender, race, ethnicity, employment status, and income

Questionnaire length: 20-minutes

Margin of error: Total sample: ± 2.2 percentage points. The margin of error among subgroups (e.g., age cohorts, race/ethnicity oversamples) is higher

Generational analysis: Gen-Z includes only the leading edge of the generation (age 18-21). The Silent (age 73 to 90)/Greatest (age 91+) generation includes only a few members of the older generation. Percentages may not equal 100% due to rounding

Mental well-being scale: The Warwick-Edinburgh Mental Well-being 14-point Scale

Selected slides: See appendix 11 for figures described in the report as well as additional data from the survey.

NOTE: The survey used the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS). This scale consists of 14 positively-worded statements (e.g., “I’ve been able to make up my mind about things”, “I’ve been feeling good about myself”, “I’ve been feeling close to other people” etc.) with five response options related to the amount of time during the previous two weeks that the statement would accurately reflect the respondents’ actual situation or state of mind (i.e. 1= “None of the time”, 2= “Rarely”, 3= “Some of the time”, 4= “Often”, 5= “All of the time”). The WEMWBS net score is a simple sum of the 14 item’s scores with a resulting minimum score of 14 (lowest mental well-being) to 70 (highest mental well-being).

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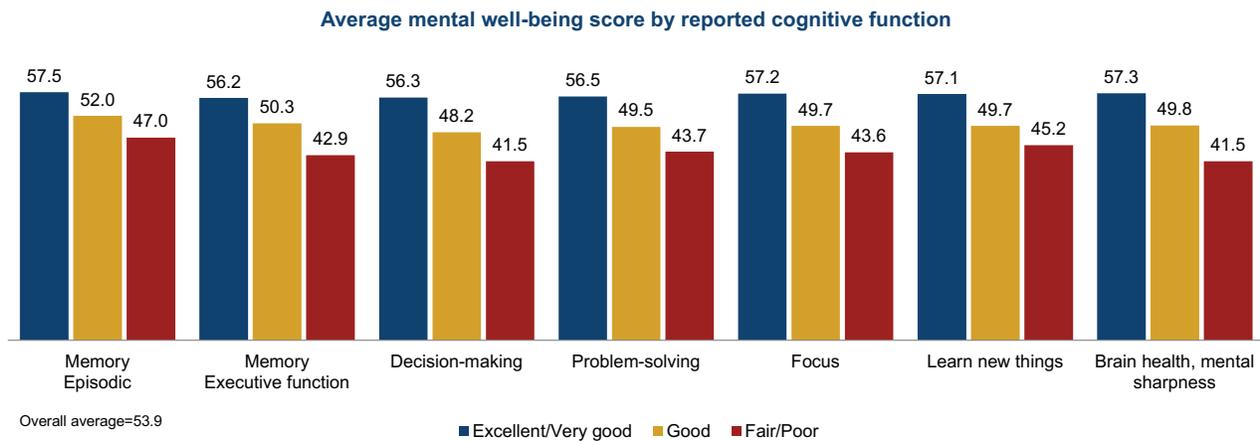
11. SELECTED DATA FROM THE AARP 2018 BRAIN HEALTH AND MENTAL WELL-BEING SURVEY

Figure 1:

Data based on the subgroup age 50 and over from the 2018 AARP Brain Health and Mental Well-Being Survey.

Higher Cognitive Function Is Related to Greater Mental Well-Being

Adults age 50 or older who rate selected aspects of their cognitive function as excellent or very good have higher average mental well-being scores compared to adults who rate their cognitive function as good, fair, or poor. The largest difference was in the rating of brain health/mental sharpness showing a 15.8-point difference.



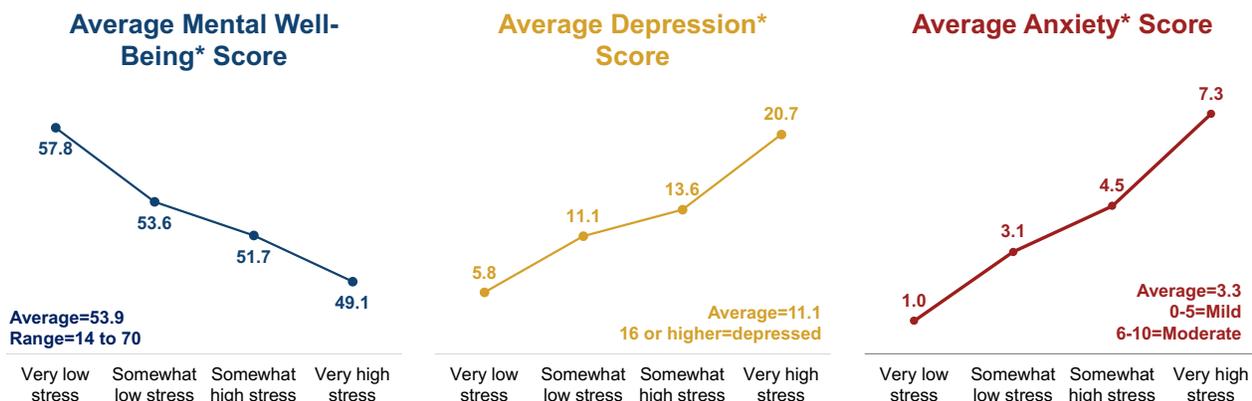
Q1 & Q2 How would you describe each of the following at this point in time? Would you say it is excellent, very good, good, fair, or poor?

Figure 2:

Data based on the subgroup age 50 and over from the 2018 AARP Brain Health and Mental Well-Being Survey.

Stressed Adults Have Lower Mental Well-Being Scores and Higher Levels of Depression and Anxiety

Mental well-being, depression, and anxiety are related to the level of stress experienced by adults age 50 or older at a snapshot in time. The average mental well-being score is more than 8 points higher for those experiencing very low stress compared to those experiencing very high stress.



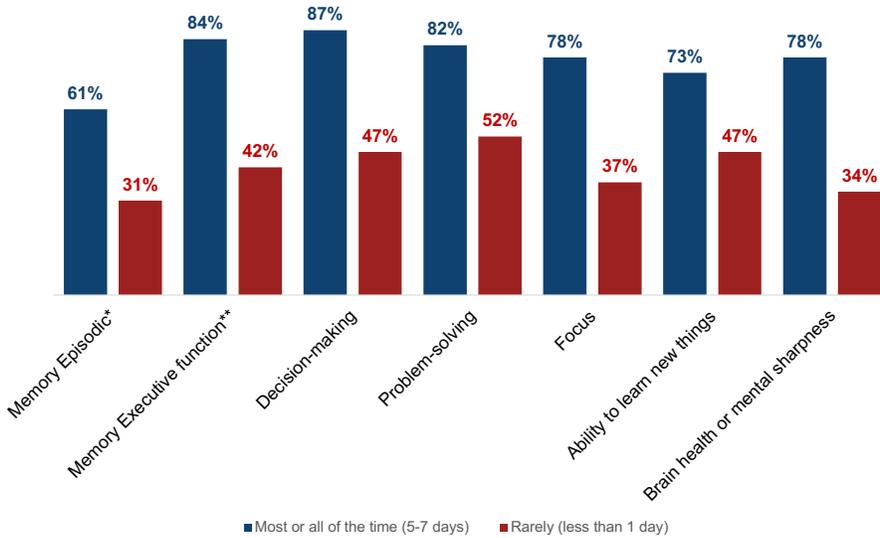
Q16 On a scale of 1 to 10, where 1 is extremely low and 10 is extremely high, please rate the overall level of stress in your life today. (1,2,3=Very low stress; 4-5=Somewhat low stress; 6-7=Somewhat high stress; 8,9,10=Very high stress)

*Mental Well-Being measured using the validated Warwick-Edinburgh Mental Well-Being Scale, Depression measured using the CES-D, Anxiety measured using the GAD-7.

Figure 3:

Data based on the subgroup age 50 and over from the 2018 AARP Brain Health and Mental Well-Being Survey.

More Adults Who Manage Stress Effectively Rate Cognitive Function Highly



Adults age 50 or older who frequently managed stress effectively were more likely to rate selected cognitive functions as “excellent” or “very good.”

More adults age 50 or older (46%) manage stress effectively “most or all of the time” compared to adults age 18 to 49 (25%).

Q1 & Q2 How would you describe each of the following at this point in time? Would you say it is excellent, very good, good, fair, or poor?

Q14 Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week. I managed stress effectively. Rarely or none of the time (less than 1 day), Some or a little of the time (1-2 days), Occasionally or a moderate amount of time (3-4 days), Most or all of the time (5-7 days).

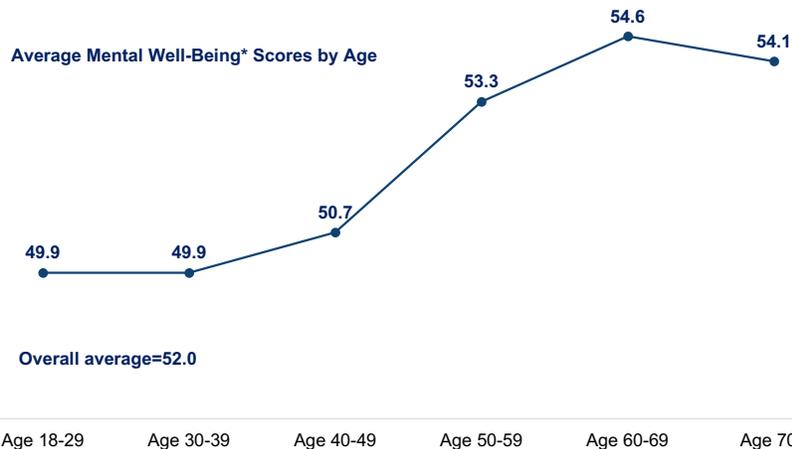
*Your ability to remember things such as names, dates, grocery lists, etc.

**Your ability to remember things such as recipes, to take medication, and to pay your bills.

Figure 4:

With Age Comes an Increase in Mental Well-Being

Older adults in their 50s and beyond have higher average mental well-being scores compared to younger adults.



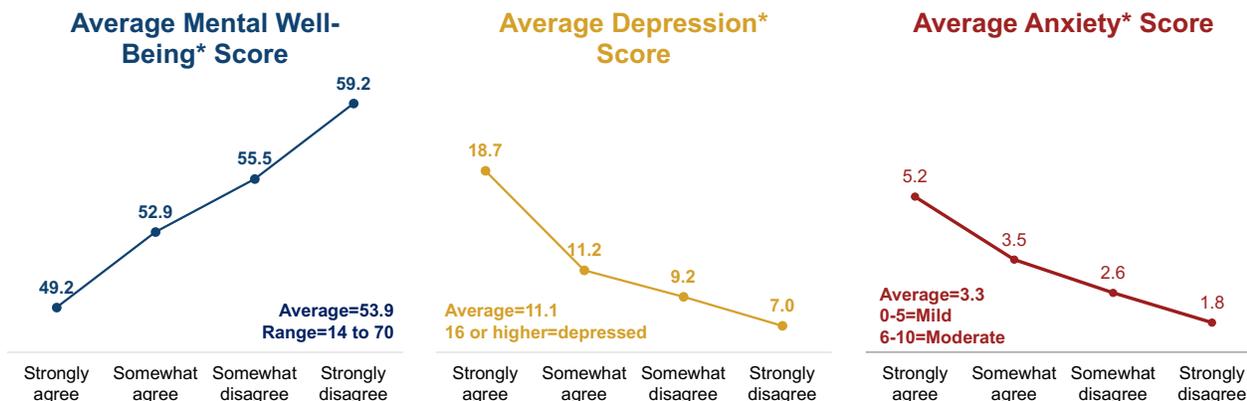
*Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) © NHS Health Scotland, University of Warwick and University of Edinburgh, 2006, all rights reserved. Scale consists of 14-items and ranges from 14-70.

Figure 5:

Data based on the subgroup age 50 and over from the 2018 AARP Brain Health and Mental Well-Being Survey.

Positive Views of Aging Related to Better Well-Being Outcomes

Adults age 50 or older who hold a more positive view of aging and DISAGREE that quality of life decreases with aging have higher average mental well-being scores and lower depression and anxiety scores.



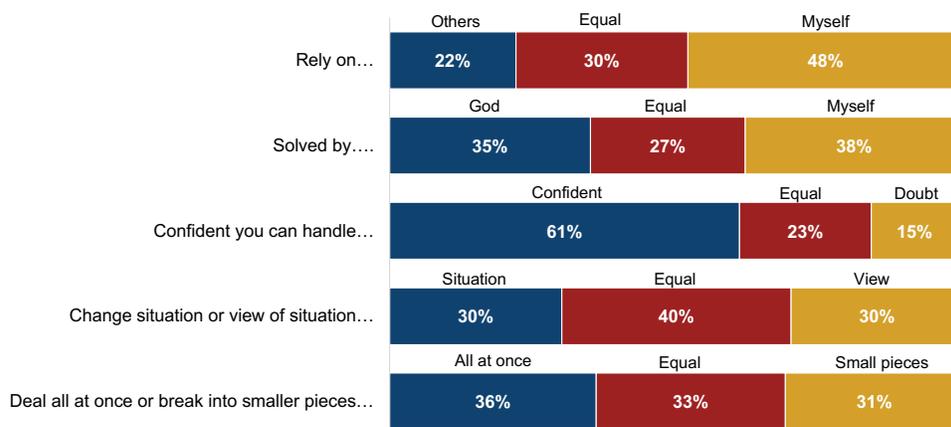
Q29 Do you agree or disagree with the statement: With aging, quality of life decreases. Strongly agree, Somewhat agree, Somewhat disagree, Strongly disagree
 *Mental Well-Being measured using the validated Warwick-Edinburgh Mental Well-Being Scale, Depression measured using the CES-D, Anxiety measured using the GAD-7.

Figure 6:

Data based on the subgroup age 50 and over from the 2018 AARP Brain Health and Mental Well-Being Survey.

Adults are Confident they can Handle Problems or Challenges

Six in 10 (61%) adults age 50 and older are confident they can handle problems or challenges in their lives. More adults tend to rely on themselves (48%) than others (22%).



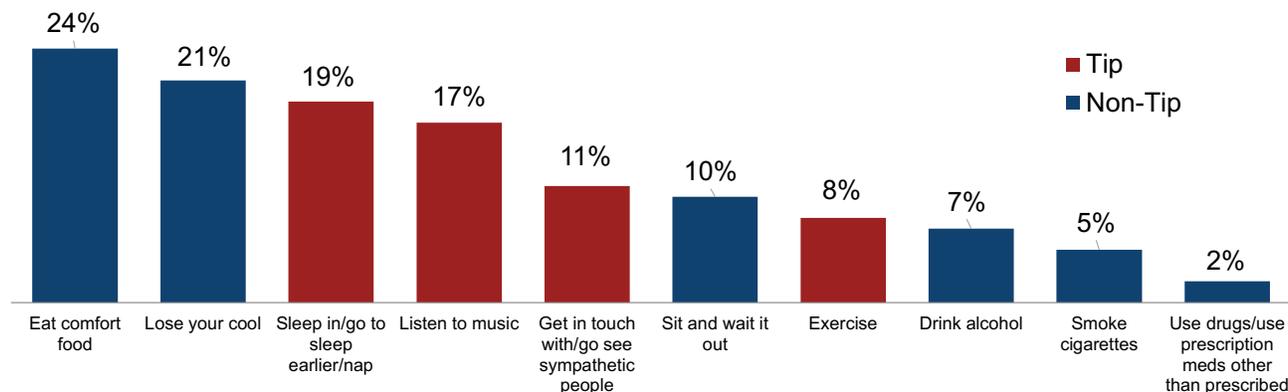
Q9 In general, when I'm facing a challenge or problem in my life...

Figure 7:

Data based on the subgroup age 50 and over from the 2018 AARP Brain Health and Mental Well-Being Survey.

Few Adults follow GCBH Mental Well-being Tips when Stressed ‘More Than Usual’

The most common activities adults age 50 and older engage in “more than usual” when facing a challenge or stressful event are: eating, losing their cool, sleeping, and listening to music.



Q13 Again when facing challenges or problems in your life that may be stressful, anxiety-producing, or cause you to be sad/depressed, how do these challenges impact your engagement in the following activities? More than usual, Less than usual, The same as usual, I do not engage in this activity

Figure 8:

Older Generations Tend to Minimally Change Behaviors When Stressed

Percentage who engage in each activity “more than usual” when faced with a challenge					
Activity	Gen Z (Age up to 21 years)	Millennials (Age 22 to 37)	Gen X (Age 38 to 53)	Boomers (Age 54 to 72)	Silent & Greatest (Age 73+)
Sleep in or nap	44%	40%	26%	20%	10%
Listen to music	41%	36%	28%	19%	9%
Lose your cool	35%	36%	32%	22%	11%
Eat comfort food	30%	39%	30%	27%	15%
Visit with sympathetic people	23%	20%	13%	13%	4%
Sit and wait it out	19%	26%	18%	10%	5%
Exercise	14%	20%	15%	8%	3%
Drink alcohol	10%	18%	14%	7%	3%
Inappropriate use of drugs	5%	6%	4%	2%	1%
Smoke	2%	10%	6%	5%	1%

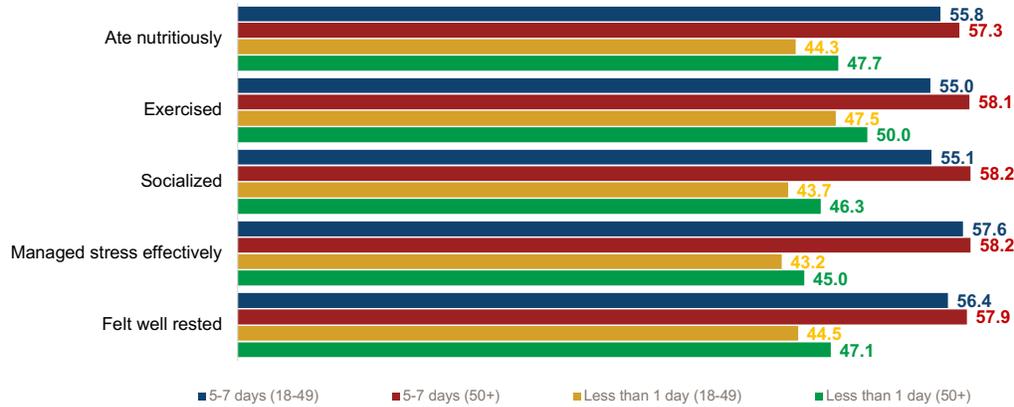
Younger generations are significantly more likely to engage in reactive coping “more than usual” when they are facing stressful challenges or problems compared to older generations. Members of the Silent/Greatest Generation are the least likely to engage in each coping behavior “more than usual” when faced with a challenge or problem.

Q13 Again when facing challenges or problems in your life that may be stressful, anxiety-producing, or cause you to be sad/depressed, how do these challenges impact your engagement in the following activities? More than usual, Less than usual, The same as usual, I do not engage in this activity

Figure 9:

Engagement in Brain-Healthy Behaviors is Related to Mental Well-Being

The more frequently adults engage in brain-healthy behaviors, such as eating nutritious meals or exercising, the higher their average mental well-being scores. Older adults tend to have higher average mental well-being scores than younger adults when healthy behaviors are engaged in at the same frequency.



Q14 Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week. I ate nutritious and well-balanced meals, I exercised, I socialized with family, friends, or others, I managed stress effectively, I was well-rested. Rarely or none of the time (less than 1 day), Some or a little of the time (1-2 days), Occasionally or a moderate amount of time (3-4 days), Most or all of the time (5-7 days).

Figure 10:

Adults Who Report Anxiety, Depression, Obesity, and Aches and Pains Have Lower Average Mental Well-Being Scores

Adults age 18 or older who report high blood pressure, high cholesterol, heart disease, diabetes, or arthritis have virtually the same average mental well-being scores as those who do not report those conditions. However, adults who report mental health concerns, obesity, and general aches and pains do have lower average mental well-being scores.

Average Mental Well-Being Score for Adults Who Report Each Illness/Condition		
Condition, disease, or illness	No, do not have condition	Yes, have condition
Aches and pains	52.8	49.9
High blood pressure*	51.8	52.6
High cholesterol*	52.1	51.6
Anxiety	53.0	46.6
Arthritis*	52.1	51.6
Obesity	52.5	49.3
Depression	53.1	44.3
Diabetes*	52.1	51.0
Heart disease*	52.0	51.2

Adults whose activities are limited “to no extent at all” (49%) by diseases, conditions, or illnesses have higher average mental well-being scores:

- To no extent at all: 54.7
- To a little extent: 50.7
- To some extent: 48.8
- To a great extent: 47.2

Fewer adults age 50 and older (43%) say they are limited by conditions “to no extent at all” compared to those under age 50 (55%).

Q20 To what extent do diseases, conditions, or illnesses limit your ability to engage in activities you would like to do? (i.e., physical activity, socializing, doing yare work, etc.) To a great extent, To some extent, To a little extent, To no extent at all.

Q21 Do you currently have any of the following conditions or illnesses?

*Not statistically significant.

Figure 11:

Data based on the subgroup age 50 and over from the 2018 AARP Brain Health and Mental Well-Being Survey.

Adults Who Report Selected Conditions Have Lower Average Mental Well-Being Scores

Adults age 50 or older who report that they have certain conditions tend to have lower average mental well-being scores compared to those who do not have these conditions. This is not the case for individuals with high blood pressure who have virtually the same average well-being scores as those who do not have high blood pressure.

Average Mental Well-Being Score for Adults Who Report Each Illness/Condition		
Condition, disease, or illness	No, do not have condition	Yes, have condition
Aches and pains	55.1	51.9
High blood pressure*	54.1	53.7
High cholesterol	54.5	52.6
Anxiety	54.7	49.1
Arthritis	54.5	52.6
Obesity	54.4	51.4
Depression	54.9	47.0
Diabetes	54.3	52.2

Adults age 50 or older whose activities are limited “to no extent at all” (43%) by diseases, conditions, or illnesses have higher average mental well-being scores:

- To no extent at all: 56.8
- To a little extent: 53.1
- To some extent: 51.9
- To a great extent: 47.6

Adults under age 50 are less likely than older adults to be limited by diseases, conditions, or illnesses (To no extent at all: 55%).

Q20 To what extent do diseases, conditions, or illnesses limit your ability to engage in activities you would like to do? (i.e., physical activity, socializing, doing yare work, etc.) To a great extent, To some extent, To a little extent, To no extent at all.

Q21 Do you currently have any of the following conditions or illnesses?

*Not statistically significant.

Heart disease and gout are excluded from this table due to the small number of cases reporting the condition.





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