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I am delighted to introduce the Fall 2015 NAN Bulletin, which is focused on multiple aspects of cognitive health. While neuropsychologists’ duties often involve diagnostic clarification and clinical management of cognitive dysfunction, recent research supports and encourages additional growth in the field by considering evidence-based strategies that actively promote cognitive health. In the Professional Issues section, experts examine related topics including lifestyle factors, nutrition, gerontechnology, and coping with cognitive changes. I also provide an overview of the emerging field of positive neuropsychology. Each piece includes several clinical take home points to aid translation of key ideas to clinical practice.

The Patient Corner includes discussion of a model that clarifies four broad categories of cognitive health strategies and interventions—the “CAPE” model. In the Journal Section, Dr. Peter Arnett, NAN Bulletin Editor, reviews a frequently downloaded article published recently in Archives of Clinical Neuropsychology that examines the impact of lifestyle engagement on executive functioning in older adults. The Student Corner piece provides a perspective on attending a NAN conference for the first time—a memorable and relatable experience for all of us.

I hope that this issue proves to be both stimulating and applicable to your clinical and academic work. Here’s to your cognitive health!

John Randolph, Ph.D.
NAN Bulletin Associate Editor

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Most people experience forgetfulness and other cognitive lapses from time to time. These are usually minor—such as forgetting a word in conversation, the name of an acquaintance, or where the keys are—but can nevertheless be concerning, particularly as we age. For these and other reasons, individuals working with a neuropsychologist often ask, “how can I improve my memory?” There are many strategies to improve our memory and other thinking skills, and various books and other references are devoted to this topic. One overarching “model” to use as a reminder for different strategies and lifestyle choices is the “CAPE” model. “CAPE” is an acronym that stands for four broad strategies to improve brain and cognitive health:

- **C**ompensatory cognitive and emotional strategies
- **A**ctivity engagement (including physical, social, and intellectual/mental activity)
- **P**revention of cognitive problems
- **E**ducation about the brain and cognitive skills

### C.A.P.E. Model

![C.A.P.E. Model Diagram](diagram.png)
The “C” in the CAPE model refers to different cognitive and emotional strategies to compensate for cognitive changes (or to promote cognitive health) in daily life. For example, some people benefit from using “external” compensatory strategies such as an appointment book, an online calendar, targeted lists, or auditory reminders such as an alarm from a smartphone. Others use “internal” (or self-generated) strategies such as attaching personal associations to new information to make the material easier to recall in the future (one example: when meeting a new person and learning their name, creating a mental image of this person standing next to someone you already know with the same name to “link” the new name with the one you’ve known for years). Even the acronym for the “CAPE” model we’re discussing here is an example of an internal strategy. Stress management strategies, such as yoga, mindfulness meditation, or talking with a friend or therapist, also promote emotional (and cognitive) health.

The “A” in this model refers to lifestyle activities that are scientifically linked to better brain and cognitive health: physical activity, social engagement, and intellectual or mental activity. We know that individuals who exercise consistently (at least 15-20 minutes per day of aerobic activity) perform better on memory and other cognitive tests and show fewer signs of normal brain changes than those who are more sedentary. Research has also found that people who are more socially active and who have larger social networks have better brain and cognitive health. Another important activity for the brain is intellectual or mental activity, which would include reading, learning a foreign language, doing crossword puzzles, or going to museums. Such activity, as with physical and social activity, is known to promote cognitive health and may reduce the risk of cognitive disorders such as Alzheimer’s disease.

The “P” in the CAPE model refers to lifestyle strategies that may prevent or minimize cognitive problems. Studies indicate that good nutritional standards, including a diet low in saturated fat, are associated with better cognitive functioning. One diet in particular, the Mediterranean diet, has a growing base of evidence linking it to better cognitive health (this diet emphasizes high fruit, vegetable, and legume intake, moderate fish and olive oil, some red wine, and low saturated fat). Seemingly simple activities such as sleep can either have a negative role on memory and other thinking skills, or can help promote these skills. Short-sleepers, or those sleeping 6 hours or less on average, tend to underperform those who sleep 7-8 hours per day on multiple cognitive measures. Avoiding smoking is another way to improve our general health and our cognitive health.

The “E” in the model relates to education about the brain and cognitive health, including having more realistic expectations for what the brain can and cannot do in different situations. Unfortunately, there remain many myths and misconceptions about the brain and its related cognitive abilities. For example, did you know that so-called “multitasking” has been known for many years to be associated with more errors, slower performance, and poorer overall productivity than “unitasking”? While this term gets plenty of attention in the media and in casual conversation, our brains simply aren’t designed to be managing multiple tasks simultaneously. Many people have also heard the myth that we only use 10% of our brains; if this were the case, neuroimaging techniques such as MRI or fMRI would show large areas of dead or inactive brain tissue. In fact, unless a brain injury or illness is present, all areas of the brain are used consistently and are interconnected through an intricate network. Further, some people enjoy taking community courses or attending lectures that discuss how the brain works; others prefer reading books or gathering information online. Regardless of medium, developing a more accurate understanding about the brain serves in its own way to improve our overall cognitive wellness.

Promoting cognitive health generally takes a small amount of effort but is certainly worthwhile throughout life to maximize our ability to function at our highest level. Below are some websites that have additional information about brain and cognitive health:

- http://www.alz.org/we_can_help_brain_health_maintain_your_brain.asp
- http://www.aarp.org/health/brain-health/

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In fall of 2014, I attended the annual National Academy of Neuropsychology (NAN) conference for the first time. Having been to academic conferences before, I had a sense of what to expect; nevertheless the NAN conference surprised me by offering unique opportunities and demonstrating several strengths. In my opinion, the NAN conference put equal emphasis on clinical work and research and thus attracted a diverse professional audience. In addition to meeting professors and career research scientists at the conference, I met men and women from myriad different professions. For example, I found myself sharing a breakfast table with a man who evaluated disability claims for the state of Arizona. In addition to discussing his career path, we had a lovely conversation about my most recent research project, which happened to be about unemployment, and its potential applicability in his field of work. This conversation allowed me to examine my own research ideas in a different light and was incredibly informative. I noticed these types of conversations occurring all around me throughout my time at the conference. Several of my peers commented that they too had fruitful conversations with individuals from backgrounds and perspectives different than their own. The conference’s atmosphere was one of reciprocal learning. Of course everyone was interested in learning from one another’s research, but graduate students and individuals early in their career also had an opportunity to learn from others’ career paths and life experience.

An additional strength of the NAN annual meeting was its student friendliness. The conference offered several student-focused talks that were free for students and trainees. Some of these talks were academic in nature such as the talks on Parkinson’s Disease and chronic pain management. Others, however, were focused on career options outside of academics for individuals with neuropsychological interests and training. I attended both the Untraditional Jobs and Private Practice talks. I thoroughly enjoyed the Untraditional Jobs talk because it opened my eyes to the breadth of opportunities my neuropsychological training could bring me. Panelists included neuropsychologists working for a contract research organization, a pharmaceutical company, the National Institute of Health (NIH), and a test publishing company. I enjoyed hearing about their career trajectories and took to heart their career advice. The Private Practice talk was also incredibly informative with Dr. Michael Santa Maria speaking frankly about the pros and cons of starting up and running a private practice. He provided practical advice about how to take on such a challenge, and had I been farther along in my graduate student tenure, I would have been frantically taking notes throughout his entire talk.

In addition to the free student talks, NAN offered free special topics presentations and general sessions throughout the conference’s duration. I attended several of these presentations, and if forced to choose, most enjoyed Dr. Stern’s presentation on chronic traumatic encephalopathy (CTE). His talk was engaging, emotional, and cutting edge; his presentation involved background on the neuropathology of CTE, photographs and personal stories of individuals affected by CTE, and fascinating new neuroimaging research exploring CTE diagnosis. Additionally, the conference offered the traditional poster sessions that come to mind when considering an academic conference. However, during these poster sessions students had the opportunity to present and defend their work to a group of judges (which is great practice!) in order to be considered for a student poster award.

Although the conference certainly offered plenty to do without having to incur additional fees, I did purchase attendance to a CE course examining memory enhancement. This talk was also phenomenal and explored research examining pharmacological, nutritional, neuropsychological, and behavioral regimens for memory enhancement. It was worth the money. Furthermore, at next year’s annual meeting students will be eligible to take as many CE courses as they like as part of their registration fee!

All and all, I had an excellent time at my first NAN conference. The conference was particularly student friendly and offered both great networking opportunities and career advice. I’m thoroughly looking forward to this year’s annual meeting, and hope to see all of you in Austin!

Margaret Cadden, M.S.
Penn State University

Margaret Cadden is currently a doctoral student in Clinical Psychology at The Pennsylvania State University. She is currently engaged in various projects examining cognitive and emotional functioning in Multiple Sclerosis (MS). She is primarily interested in behavioral and neurological indicators of cognitive reserve. She recently completed her Master’s thesis which involved examining predictors of employment status in MS.

Review by Peter Arnett, Ph.D., Penn State University

*Editor’s note: This article is one of the most frequently downloaded articles on lifestyle factors and cognitive functioning from the Archives of Clinical Neuropsychology within the past couple of years.

Rationale for the Study:
Engaging in an enriching lifestyle has been hypothesized to promote brain and cognitive health with aging. There is a growing body of literature that shows that being involved in cognitively enriching activities, as well as physical and social activity, may delay the onset of cognitive decline with aging. However, cognitive outcome variables have typically involved domains such as declarative memory, perceptual speed, verbal speed, and visuo-spatial ability; executive functioning (EF) has been overlooked. The current study focuses on EF as the key outcome variable. Prior to laying out their goals, the authors provide a nice review of lifestyle factors associated with poor or positive cognitive aging, especially focusing on cognitive stimulation, physical exercise, and social engagement.

Overarching Goal:
The investigators’ aims were twofold: 1) Examine the extent to which lifestyle factors moderate the relationship between cognitive status and executive functioning (EF) performance; and 2) assess whether lifestyle factors predict either stability or change in cognitive status.

Methods:
The participants were elderly community-dwelling adults from the Victoria Longitudinal Study (VLS), and were divided up into groups according to their level of cognitive functioning. Cognitive status groups were either cognitively elite (CE), cognitively normal (CN), or cognitively impaired (CI), with groups defined according to normative performance on a battery of standard neuropsychological tests measuring episodic memory (e.g., word list recall), inductive reasoning, perceptual speed (e.g., Digit Symbol subtest), verbal fluency, and vocabulary.

To measure the lifestyle factors, the authors used the Victoria Longitudinal Study Activity Lifestyle Questionnaire (VLS-ALQ). This 67-item self-report measure assesses the frequency of involvement in seven types of everyday activities over the past 2 years. Activities include physical (e.g., jogging), self-maintenance (e.g., preparing a meal), social (e.g., visiting friends), travel (e.g., holiday trips), passive information processing (e.g., reading the newspaper), integrative information processing (e.g., playing a musical instrument), and novel information processing (e.g., completing income tax forms). Seven composite subscales were created based on summing the average responses on items within each subscale.

Finally, the authors derived an EF composite from six different EF measures including the Stroop, Color Trails, Hayley Sentence Completion, Reading Span, Computational Span, and the Brixton Spatial Anticipation Tests. The latter test may not be familiar to some readers, but it is akin to the WCST, in that it involves rule attainment and set shifting.

Results:
The authors found that cognitive status significantly predicted EF, accounting for 12% of the variance; unsurprisingly, higher cognitive status predicted better EF. After controlling for cognitive status, one additional lifestyle variable stood out as a significant predictor of EF: Greater engagement in novel information processing activities.

In examining interactive relationships, these investigators found that self-maintenance and social activities independently moderated cognitive status differences in EF. Breaking things down further, they found that the interaction was driven by the CI group. In particular, CI adults who reported being more involved in social activities had better EF than those who reported being less involved. However, as their Figure 1 shows, this effect is rather modest, with the high social activity group only performing about 3 t-score units better on the EF composite than the low social activity group. When considering the CE and CN groups, social engagement made no difference in terms of EF; low social engagement groups performed just as well on the EF composite as high social engagement groups.

The second key set of analyses pursued by these investigators involved trying to predict stability and change in group status from lifestyle factors. Here, the most important factor was engagement in novel information processing activities. This lifestyle factor predicted stability in CE vs. CN, CE vs. CI, and CN vs. CI groups. In each case the probability of being in the higher functioning group was greater as involvement in novel
information processing activities increased. Put more simply, higher functioning groups were characterized by greater involvement in novel information processing activities in their daily lives than lower functioning groups.

The only comparison differentiated by lifestyle factors was for the stable CI group compared with the CI group that improved to being cognitively normal (CN) across the 4.5 year long duration of the study. In this case, engagement in physical activities significantly predicted group membership. In short, the odds of improvement in cognitive status from CI to CN was greater with higher reports of engagement in physical activity.

To sum up, then, first, although the authors examined seven different lifestyle domains, only engagement in novel mental stimulation, physical activity, and social activity had any predictive power within their study framework. Second, cognitively impaired (CI) individuals who also reported engaging in more social activities showed better executive functioning than CI individuals who engaged in fewer social activities. Third, engagement in novel mental stimulation was consistently associated with individuals maintaining their status in higher functioning cognitive groups compared with lower functioning groups. Finally, cognitively impaired individuals who reported engaging in more physical activity were more likely to improve to being cognitively normal across the 4.5 year duration of the study.

So what does it all mean? Given the correlational nature of the authors’ study design, it is not possible to draw any clear causal conclusions. Regarding social engagement moderating EF in the cognitively impaired group, for example, it may be that increased social engagement leads to better EF or that better EF leads to more social engagement. Alternatively, a third, perhaps unmeasured, variable might account for this relationship. For example, it may be that the CI individuals who engaged in less social activity were also more cognitively impaired overall relative to the CI individuals who engaged in more social activity. It is also possible that these less socially active CI individuals had more structural brain damage or more functional brain anomalies. We don’t know, because these factors are not reported.

So, what can clinicians take away from this interesting study? Although, again, causal factors are difficult to tease out, the results of this study add to the growing body of data showing that lifestyle factors such as engagement in cognitively stimulating activities, social engagement, and involvement in physical activity are associated with better cognitive functioning as we age. Additionally, the effects seem to be most evident in individuals who already show some cognitive impairment. Though this body of literature will surely evolve so that causal issues are clarified, clinicians would be well-advised to counsel elderly patients, especially those already showing some cognitive impairment, to maintain their social engagement, seek out cognitively stimulating activities, and maintain their physical activity. De Frias and Dixon’s (2014) study also underscores the importance of clinicians routinely screening aging patients about their involvement in these important lifestyle activities so that adjustments can be made accordingly. With this said, the VLS-ALQ used in the present study, though comprehensive, is probably too long (67 items) to be used in routine clinical practice. There is a need for briefer measures that could be employed for clinical use, something future studies could address.

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**Dr. Peter Arnett** received his Ph.D. in Psychology (Clinical) from the University of Wisconsin – Madison, and completed a post-doctoral fellowship in Clinical Neuropsychology at the Medical College of Wisconsin under the direction of Drs. Stephen Rao and Thomas Hammeke. He is currently a Psychology Professor and Director of Clinical Training at Penn State University. Dr. Arnett’s research has focused on clinical neuropsychology, with an emphasis on studying secondary influences on cognitive functioning in persons with multiple sclerosis (MS) and mild traumatic brain injury. He is a fellow of the NAN, past winner of NAN’s Nelson Butters Award for Research Contributions to Clinical Neuropsychology, was Program Co-Chair for the 2010 Mid-Year Meeting of the International Neuropsychological Society (INS), and is a board member of the INS. Dr. Arnett is the author of over 100 research articles and book chapters, and has edited a book entitled, *Secondary Influences on Neuropsychological Test Performance*. He is an editorial board member of several journals, and has received grant funding from the National MS Society, NIH, and NIMH.
In recent years, there has been an exponential increase in media coverage and discussion about lifestyle activities associated with cognitive health. Several factors likely contribute to this increased focus, including a large and rapidly increasing population of older adults (the population most at risk for cognitive decline), mounting evidence that the cellular abnormalities associated with Alzheimer’s dementia often begin years before the emergence of clinical symptoms (fueling the hopeful possibility of altering the trajectory of abnormal cellular change), and the current lack of a cure for Alzheimer’s dementia. Several lifestyle factors have been shown to decrease the risk of future dementia and/or delay symptom expression, including cardiovascular exercise, active engagement in cognitive activities, social engagement, treatment of depression, adequate sleep, and nutrition. In particular, the relationship between nutrition and cognitive health is a growing area of focus in the context of findings showing that nutrition impacts cognitive functioning in individuals with and without cognitive impairment.

The effects of nutrients on cognitive functioning can be surprisingly rapid and specific. For example, one study showed enhanced memory functioning only one hour following consumption of a protein drink, decreased memory one hour following consumption of a glucose drink, and enhanced alertness after both drinks. In addition, low glycemic index foods (in which glucose peaks and declines slowly) consumed at breakfast have been shown to enhance verbal memory over the course of the morning as compared to high glycemic index foods (in which glucose peaks at a high level and declines rapidly), and the glucose level of an evening meal has been shown to impact cognitive functioning the following morning. In addition, increased consumption of refined sugar and high fat is associated with reduced performance on hippocampal tasks of learning and memory.

Although it is helpful to understand which nutrients are associated with a suboptimal effect on cognitive functioning, it is also important to understand the many nutrients that have been shown to exert a positive impact on cognitive functioning. Recently, there was wide media coverage of the first randomized clinical trial examining the impact of diet on cognitive health, a substudy of the Prevencion con Dieta Mediterranea (PREDIMED). PREDIMED showed an impressive 30% reduction in the incidence of cardiovascular disease in older adults at high risk for cardiovascular compromise who followed a Mediterranean diet supplemented with extra virgin olive oil or mixed nuts for 5 years, versus a fat-reducing control diet. The Mediterranean diet included increased consumption of vegetables, fruits, legumes, fish, and red wine, and decreased consumption of butter, red meat, sweetened beverages, and commercial sweets.

The PREDIMED cognitive substudy analyzed neuropsychological functioning at baseline and 4.1 year follow-up, showing improvement on measures of memory and executive functioning in those individuals following the Mediterranean diet, and a decline in those following the fat-reduced control diet, after controlling for variables including APOE E4 genotype (a genetic risk factor for Alzheimer’s dementia), vascular risk factors (e.g. high blood pressure, high cholesterol), level of education, sex, age, and other cognition-related variables. Mechanisms of action were unclear, though were surmised to potentially relate to reductions in white matter hyperintensities, subclinical brain infarcts, and/or vascular compromise. Other research suggests that the positive effect of the Mediterranean diet may relate to both vascular and non-vascular variables (metabolic, oxidative, and inflammatory factors).

PREDIMED and its cognitive substudy provide support for previous findings that the Mediterranean Diet lowers the risk of cardiovascular and major chronic diseases, including Alzheimer’s dementia, suggesting a globally positive impact on heart, brain, and overall health. Another study examining cognitive performance in a community group of older adults over 4.1 years found slower rates of cognitive decline in individuals following either the Mediterranean Diet or the Dietary Approach to Stop Hypertension (DASH) diet. These and other studies provide growing support for the increasingly popular concept that “what is good for the heart is good for the brain.”

Building upon these findings, a recent study investigated the efficacy of a new diet, the ‘Mediterranean-dietary approach to systolic hypertension diet intervention for neurodegenerative delay’ (MIND) diet. MIND expanded upon the Mediterranean diet by including specific nutritional components that were shown to be neuroprotective in previous cognitive studies, and included 10 brain healthy food groups (green leafy vegetables, other vegetables, nuts, berries, beans, whole grains, seafood, poultry, olive oil, and wine), and five unhealthy food groups (red meats, butter and stick margarine, cheese, pastries and sweets, and fried/ fast food). Over 10 years, older adults with the highest score on a MIND diet consumption index showed a 7.5 year slowing of cognitive aging across five cognitive domains—episodic memory, working memory, semantic memory, visuospatial ability, and perceptual speed—as compared to individuals with the lowest MIND diet scores. Researchers surmised that the neuroprotective effects of the MIND diet may relate to previous research findings showing antioxidant and anti-inflammatory properties of MIND diet foods, and inhibition of beta amyloid deposition and neurotoxic death.
Importantly, the positive impact of nutrition on cognitive functioning is not isolated to cognitively normal older adults, and has also been observed in individuals diagnosed with Alzheimer’s dementia. In a double-blind randomized clinical trial, patients consuming a formulation of nutrients related to healthy cellular function showed improved performance on the Dementia Rating Scale as compared to a control group. Results supported previous findings showing improved delayed verbal memory in individuals with mild Alzheimer’s dementia who consumed a medical food also containing nutrients associated with healthy cellular function. Although the exact mechanisms of action are unknown, animal studies may provide some clues. In one study, animals supplemented with dietary precursors involved in healthy cell function showed neuroprotective cellular structural changes that were opposite the pathological changes seen in Alzheimer’s disease, including the formation of new synapses, decreased beta-amyloid plaque burden, and improved learning and memory.

Although much more research is needed to replicate findings, clarify mechanisms of action, and determine relative nutrition effects in the normal population and different clinical groups, available research provides promising ideas for how we might lead patients, communities, and ourselves to begin the process of enhancing cognitive health. Indeed, the possibility of slowing cognitive aging – which may be only one component of the larger health benefits associated with positive nutrition effects – may provide new persuasive potential for individuals to engage in the process of dietary change. As neuropsychologists, we are uniquely positioned to communicate information about cognitive health promotion to a frequently receptive audience of patients, family members, and colleagues. Furthermore, our expertise in cognition, behavior change, and research design provides us with a rare ability to promote and study the effects of nutritional and other factors associated with cognitive health and contribute to this promising field.

**Clinical Take Home Points:**

1. Nutrition impacts cognitive health in individuals with and without cognitive impairment.

2. The Mediterranean, DASH, and MIND diets have been shown to enhance cognitive health.

3. Neuropsychologists are uniquely trained to study and discuss with patients lifestyle factors that promote cognitive health.

Michelle Braun received her PhD in clinical psychology and minor in neuroscience from the University of Wisconsin-Milwaukee, and completed her internship at Yale University School of Medicine, and postdoctoral fellowship at the Boston VA/Harvard Medical School. Dr. Braun is a neuropsychologist at Wheaton Franciscan Healthcare in Racine, Wisconsin, and previous Assistant Director of Inpatient Mental Health at the Boston VA and Instructor of Psychiatry at Harvard Medical School. She serves on the Board of Directors of the American Academy of Clinical Neuropsychology and the Scientific and Advisory Panel of the Southeastern Wisconsin Alzheimer’s Association. Dr. Braun was honored to be named to the “40 Under 40” class of 2013 by the Milwaukee Business Journal, and was featured in a PBS program, “Boost Your Brain.”
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The American population age 65 and over is growing at rates never before seen, with cognitive aging and other critically important issues facing this group. Advanced age is also the most significant risk factor for disorders of cognition such as Alzheimer’s disease. Further, fear of developing dementia is a significant cause of worry among older adults, many of whom seek to learn strategies within their control that can contribute to successful brain aging. Fortunately, there are a number of modifiable lifestyle factors that promote cognition in older adults. Here we will briefly review four of these: exercise, social activity, mental mindset, and cognitive stimulation.

**Exercise**
Engaging in regular exercise is one of the most effective ways to maintain brain and cognitive health. Consistent exercise has been associated with the prevention of cognitive decline as one ages\(^1\). It is common knowledge that exercise has beneficial effects on cardiovascular health, so it should come as no surprise that exercise positively impacts cognition through vascular mechanisms, including the minimization or elimination of many of the conditions that are considered risk factors for stroke, such as hypertension, hypercholesterolemia, diabetes, heart disease, and obesity\(^2\). In addition to improving cognitive functioning by contributing to the physical health of the body, there is also evidence suggesting that exercise may directly affect brain structure. For example, researchers have found an association between higher levels of aerobic fitness, increased hippocampal volume, and improved memory functioning\(^3\). The hippocampus and surrounding areas of the brain tend to be larger in fit older adults compared to those with lower fitness levels. One study examined the effect of a one-year aerobic exercise training group on the size of the hippocampus in 120 adults aged 60-73. These researchers found that after 1 year of aerobic training, the exercisers showed as much as a 2% increase in the size of the hippocampus, roughly equivalent to reversing the normal brain aging process by 1-2 years. Exercise also helps to minimize pain, reduce fall risk, improve mood, reduce stress, and improve sleep, all of which can impact memory and other cognitive abilities.

These results suggest that exercise is a promising vehicle for maintaining cognitive functioning and reducing functional disability in older adults. The Centers for Disease Control recommends 30 minutes of moderate physical activity (e.g., brisk walking) at least 5 days per week and strength training at least 2 days per week. Note that recent research has suggested that the current CDC recommended amount of exercise may only be a starting point – more exercise may be better for our longevity and health\(^4\). Taken together, these findings highlight the important role that an exercise routine can have in promoting older adults’ brain and cognitive health.

**Socialization**
Social isolation is a burgeoning problem for older adults in the United States\(^5\) and is associated with an increase in depressive symptoms\(^6\) and subsequent cognitive decline\(^7\). In the gerontological literature, social activity is a general construct that includes one-on-one conversation, informal group activity, formal group activity, and leisure activity\(^8\). Regardless of the precise nature of socialization, social activity has been consistently correlated with less or slower cognitive decline\(^9\). In a longitudinal study following 1138 older adults over 5 years, those who were most socially active showed 70% less cognitive decline than those with the lowest rates of social activity\(^10\). However, quality and not just quantity of social activity matters in old age. Negative social interactions have been shown to have a deleterious cognitive impact on older individuals\(^11\). For example, negative social experiences have been found to be a risk factor for accelerated cognitive decline in old age\(^12\). Considering these observations, it is important to encourage positive social interactions with others, particularly given that enjoyment of social activities has been associated with decreased risk of cognitive decline in old age\(^13\).

When considering the prescription of social activity for older adults it is important to note both quantity and quality of these interactions. Older adults should strive to remain socially active and engaged, cultivate positive relationships, and reduce the number of negative interactions.

**Mental Mindset**
Older adults’ perceptions of the cognitive, physical, and behavioral changes associated with aging are influenced by various external factors, such as aging stereotypes. Indeed, evidence suggests that such stereotypes are becoming progressively more negative as the aging population grows\(^14\). Negative stereotypes of aging also adversely impact the attitudes, cognitions, and behavior of older
Researchers have proposed that aging stereotypes are internalized across the lifespan and findings show that negative aging stereotypes lead to decreased memory, worse handwriting, and lower self-confidence in a laboratory setting\(^\text{15}\). In addition to the well-documented deleterious impacts of negative stereotypes, there is an important protective role offered by having positive stereotypes about aging. Recent evidence suggests that the detrimental effects of a negative mindset, such as decrements in physical function, may be at least partially reversed by interventions that promote positive aging stereotypes and strengthen positive self-perceptions of aging\(^\text{16}\). In light of such findings, researchers have encouraged health care providers to decrease their own perpetuation of age discrimination, increase positive dialogue related to aging, and model nondiscriminatory attitudes and behaviors about aging\(^\text{14}\). Such efforts on the part of providers may have a significant impact on older adults’ perceptions of aging, and, consequently, on their cognitive and physical health.

Older adults are advised to consider the way that they view the aging process. Negative attitudes about aging should be challenged and positive attitudes about aging should be cultivated. For example, older adults should make a concerted effort to notice other older adults that they consider to be successful agers and use those examples to guide their view about aging.

### Cognitive Stimulation

Cognitive stimulation refers to activities that keep one's brain active, such as learning a new language or engaging in a book club. Frequent mental stimulation such as reading a newspaper, writing a letter, or visiting a library leads to better cognitive functioning in older adults\(^\text{17}\). Musical ability in early life has long been associated with better speech and language skills across the lifespan, but recent research has also suggested that engaging in musicianship can offset age-related speech declines\(^\text{18}\). Other “complex” cognitive activities have shown promise in maintaining cognition in the early stages of a neurodegenerative disease, including mahjong, tai chi\(^\text{19}\), and social engagement\(^\text{20}\).

Older adults are encouraged to stay engaged with the world around them. Some refer to the maxim “use it or lose it” when speaking of maintaining brain health. Motivation and task engagement are likely to be strongest for activities that are enjoyable and spark personal interest, so older adults should choose from the wide array of cognitively stimulating activities that are available to them, tailoring their selections to individual interests.

#### Clinical Take Home Points:

1. Consistent exercise has been associated with promoting cognitive health and increased brain volume in elders. The CDC recommends 150 minutes of moderate aerobic exercise per week.

2. Older adults who are more socially active have less risk of cognitive decline, and both quality and quantity of interactions relate to cognitive health.

3. Positive attitudes about the aging process are associated with better cognitive health.

4. Elders benefit cognitively from staying intellectually stimulated and engaged, even in the face of cognitive decline.
Maureen K. O’Connor, Psy.D. is the Director of Neuropsychology at the Bedford VA Hospital, Assistant Professor of Neurology at Boston University, and the Associate Director of the Education Core at the Boston University Alzheimer’s Disease Center. Dr. O’Connor’s research interests include understanding and developing interventions to improve the lives of adults with memory loss and the lives of the family members that help provide care. She currently holds a Research, Rehabilitation, and Development SPiRE Award to study the impact of an intervention designed to educate older adults about brain aging and dementia and lifestyle factors that contribute to brain aging.

Erika L. Clark, Ph.D. graduated with a B.A. from Connecticut College in behavioral neuroscience. She received her Ph.D. from Suffolk University. She is currently a postdoctoral fellow in neuropsychology at the Bedford VA Hospital. Dr. Clark is currently working on an intervention study with Dr. O’Connor designed to investigate the utility of using a warning to reduce memory errors in healthy older adults and older adults with Mild Cognitive Impairment.

Ryan T. Daley, B.A. graduated magna cum laude with a bachelor’s degree from Gordon College in 2013, where he studied both psychology and philosophy. His philosophy thesis focused on personal identity in relation to Alzheimer’s disease. In 2014 he accepted an appointment at the Edith Nourse Rogers Bedford VAMC as a Health Science Specialist. Mr. Daley is actively working with Dr. O’Connor on several studies related to aging and Alzheimer’s disease.

References
References, continued


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Technology to Support Aging and Cognitive Health

Joyce W. Tam, M. A. and Maureen Schmitter-Edgecombe, Ph.D.
Washington State University

An estimated 5.3 million Americans have Alzheimer’s disease.\(^1\) With this number expected to increase threefold by 2050, it is becoming increasingly more urgent to develop innovative and preventative health care solutions that can promote cognitive health and functional independence. Advances in the field of gerontechnology have the potential to offer innovations for home-based prevention, early detection, functional assessment, independent living, safety, behavioral intervention, and social and caregiver support. Gerontechnology is the study or application of technology in the geriatric population to enhance living and working environments and adapted medical care.\(^2\) Clinical neuropsychologists, with their expertise working with cognitively impaired patients in the areas of assessment, intervention and cognitive rehabilitation, are in a unique position to aid in the development, evaluation, use and dissemination of these technologies to support aging and cognitive health.

Prior research indicates that aging services technologies (ASTs) can facilitate functional independence, promote brain health, and reduce caregiver burden.\(^3\) ASTs are defined as “health technology that meets the health-care needs of seniors, individuals with disabilities, and the caregivers of such seniors and individuals.”\(^5\) Examples of ASTs include pill organizers, reminder alarms, fall alerts, planners, and mobility devices. Many devices can be used alone or jointly to provide short-term (e.g., post-surgery rehabilitation) and long term assistance. ASTs also include monitoring and telehealth technologies, such as home blood pressure monitors and blood glucose tests, which can aid with symptom management and allow for more proactive health care. In addition, the use of activity monitoring devices, such as a pedometer or Fitbit, can play a role in prevention by helping to increase physical activity engagement.\(^6\) Social media, text messaging, and video-conferencing can also allow older adults to connect with their loved ones or participate in support groups regardless of geographic location.

With advances in sensor technologies (e.g., sensors have become miniature, low power, low cost and high capacity) and machine learning techniques, smart technologies that can adapt, sense, infer, learn and intervene are being developed. Sensor-filled smart homes (environmental or fixed devices), activity trackers (wearable devices) and smart phones (portable devices) allow for data to be collected automatically, continuously and in an unobtrusive manner while people perform their normal activities of daily living. Machine learning techniques can then be applied to the sensor-based data to learn about a user’s routines, everyday activities and behaviors. This data can then be used to support proactive and preventative interventions in the real-world environment. Smart technologies can also reduce limitations associated with some current technologies, such as requirements for the individual or a caregiver to manually schedule reminders at rigid times for daily activities such as exercise or cooking.

Our group (affiliated with the Center for Advanced Studies in Adaptive Systems (CASAS) at Washington State University (WSU)) has been studying the role of smart environments as a type of “Cognitive Prosthesis” wherein the smart technology operates alongside humans to monitor, maintain, and enhance their health and functional capabilities and overcome their limitations. Rather than using cameras, different sensors are used in combination to provide insights about activities being performed in the home and everyday environment. Examples of smart home sensors include (a) infrared sensors, or motion sensors, that provide information about a person’s location within the home, (b) magnetic door sensors that indicate when a particular door or cabinet is open or shut, (c) vibration and pressure sensors attached to particular items (e.g., walker, medicine bottle) that indicate when the item is in use, and (d) temperature and humidity sensors that sense and measure temperature (e.g., water, stove burner, ambient) and humidity. One advantage of environmental sensors is that they are passive and the resident does not need to wear anything or perform activities in any particular manner for the smart home to gather information. Several different machine learning and classification techniques can then be applied to the sensor data to learn and identify activity patterns that can be used to provide proactive health care and health assistance.

Our work suggests that we can use sensor data and machine learning techniques to develop algorithms that recognize activities, provide insights about functional status, and automate intervention.\(^7\) The data for our studies has been collected from younger, older and cognitively impaired individuals completing everyday activities in a smart apartment test-bed on the WSU campus and from in-home deployments of our sensor technology. We have shown that we can design algorithms that use sensor data to recognize everyday activities (e.g., cooking, grooming),\(^7,9\) generalize across homes,\(^10\) and discover new activities (e.g., bedtime routine, scrapbooking habit)\(^10,11\). We have also used activity patterns observed in sensor data to determine how well an individual is completing everyday tasks\(^8,12\) and to serve as the basis for activity-aware real-time prompting.\(^13,14\)

Smart technologies offer several exciting opportunities for preventative and proactive health care through continuous monitoring. Neuropsychologists and healthcare providers often gather clinical information through self-report or informant-report,
which can be biased or insensitive to subtle changes. Results from an isolated assessment of cognition or other performance-based tasks can also be influenced by secondary factors (e.g., mood, testing fatigue, etc.) and does not capture variability in daily functioning over time. Continuous assessment of functioning in the everyday environment using smart technologies could provide added reliable information and insight regarding health and functional status, including sleep duration, activity level, and ability to perform everyday activities. For example, such technologies could capture new, acute, or subtle cognitive and physical changes in participants’ everyday functioning (e.g., change in walking pattern through the house, slowing in activity completion) leading to earlier and more proactive interventions. Smart technologies could also be used to unobtrusively monitor compliance with pharmaceutical regimens and rehabilitation programs, resulting in better patient outcomes. For example, if a patient experiences difficulty putting into place a needed intervention (e.g., in-home exercises following knee replacement surgery), the clinician could be alerted immediately increasing the chance of a non-complicated recovery.

Smart technologies also have the potential to support real-time interventions. Prompting technologies have been shown to facilitate completion of everyday tasks in older adults and individuals with cognitive impairment. Activity-aware prompting technologies that learn a resident’s routine and deliver prompts based on context have the potential to reduce or delay functional disability, support preventative brain health behaviors and lessen health-care costs. For example, prompts may be used to cue the use of compensatory strategies, such as using a memory notebook, which can help cognitively impaired individuals maintain independence. Based on user activity and daily schedule, prompts can also be delivered appropriately and seamlessly to encourage healthy lifestyle behaviors (e.g., engage in physical or social activities). Technologies that allow for optimal timing of prompts in the everyday environment with suitable rewards could lead to enhanced compliance with interventions and improved quality of life for patients while also supporting caregivers.

While emerging data demonstrate the benefits of smart technologies, numerous challenges remain (e.g., robust identification of rare events, validation, privacy and confidentiality). There are, however, many technologies already available that can be used to support the cognitive health of patients (e.g., smart watch, Skype). According to a recent Congress report, a lack of awareness of technologies was highlighted as one of the barriers to technology utilization. Neuropsychologists are in the unique role to provide appropriate recommendations about health technologies and must remain educated about these technologies and their potential benefits for patients.

Clinical Take Home Points:

1. Health technologies can promote brain health and assist independent living, as well as reduce caregiver burden and societal healthcare costs.

2. A variety of sensors can be used to collect real-time, continuous activity data in a passive, nonobtrusive manner. With the use of machine learning techniques, algorithms can be developed to shed light on an individual’s health and functional status within the everyday environment.

3. Smart technologies that learn about the user and their environment have the potential to support everyday activities and to assist in rehabilitation and proactive interventions through real-time prompting and monitoring of real-world responses to intervention.

4. Neuropsychologists are in a unique position to promote health technology use. Continuous professional training on health technology is important. Please visit our website, www.tech4aging.wsu.edu to view a video series and related informational booklet on ASTs designed to support independent living. We are in the process of collecting data from professionals, users and caregivers to evaluate the usefulness of the video series. Individual videos discuss aids to support medication management, memory, daily living, fall prevention, mobility, communication, vision, and hearing.
Joyce Tam, M. A. is a graduate student in clinical psychology at Washington State University and an Integrated Graduate Education and Research Traineeship (IGERT) fellow. Her research interests include further understanding cognitive changes in older adulthood and developing intervention programs that enhance quality of life and functional independence. Her dissertation project focuses on understanding factors that may contribute to aging services technologies awareness and acceptance. She will begin her clinical internship at The University of Chicago Medicine this summer.

Maureen Schmitter-Edgecombe, Ph.D. is a Professor in the Department of Psychology at Washington State University. She has authored or co-authored more than 100 peer-reviewed publications investigating cognitive deficits, everyday functioning and rehabilitation issues primarily with aging, neurodegenerative, and traumatic brain injury populations. The long-term objective of her current transdisciplinary research in the area of gerontechnology is to improve human health and impact health care delivery by developing smart technologies that aid with health monitoring and intervention. Her research has been funded by over $10 million in grants. Funding from NSF and NIA has also enabled Dr. Schmitter-Edgecombe and her colleagues to open the door to new avenues of health and science research by training a new breed of undergraduate and graduate students in complementary disciplines (e.g., computer science, engineering, psychology, and health care).

References
Coping with Cognitive Decline

Amanda Rabinowitz, Ph.D.
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As neuropsychologists, we are experts in identifying and characterizing the nature of cognitive impairments due to neurological conditions such as multiple sclerosis (MS), traumatic brain injury (TBI), stroke, dementia, and attention deficit hyperactivity disorder (ADHD). What comes next is often less clear. Effective cognitive rehabilitation programs may not be available to many of our patients. Even those who do receive treatment may endure persisting cognitive deficits. These deficits have a profound effect on patients’ lives, influencing work, social relationships, and participation in leisure activities. Hence, it is unsurprising that depression is more prevalent in neurological patient groups than the general population.1

Unfortunately, full remediation of cognitive deficits is simply not in reach for the vast majority of patients. However, many patients can continue to participate in work, family, and recreation to a meaningful degree. Successful adjustment to a new level of cognitive function is critical to general contentment, wellbeing, and quality of life. Modifiable psychosocial factors, such as coping, can play a significant role in reducing distress and promoting positive outcomes.

Coping is the set of cognitive processes and behaviors that an individual uses when encountering stress in order to reduce or manage distressing emotional states.2,3 Cognitive decline leads to a proliferation of new stressors. Activities of daily living that were once routine, such as managing finances and preparing meals, can all of a sudden present challenges. For patients in the prime of life, careers and family obligations may be substantially altered. Sense of self may be threatened as patients attempt to redefine their identity in the face of a new disability. How patients respond to these stressors can be the determining factor in many important outcomes such as depression, employment, and maintenance of health promoting behaviors.

Decades of research have demonstrated that coping style modulates the relationship between stress and negative emotional states.4,5 Traditionally, coping strategies have been conceptualized as belonging to one of two general domains: problem-focused coping and emotion-focused coping. Problem-focused coping refers to active coping behaviors aimed at altering the source of stress, whereas emotion-focused coping is intended to regulate emotional responses to a stressor.6 Studies in the chronic illness literature have demonstrated that high levels of depression are associated with emotion-focused coping. Problem-focused coping, on the other hand, is associated with better adjustment and lower levels of distress.11,14

Although much of the coping research has relied on the problem-focused vs. emotion-focused distinction, this dichotomous conceptualization of coping has been criticized for being too simple.15 In particular, research has shown that there are different types of emotion-focused coping.16,17 Denial coping is clearly maladaptive, however, some forms of emotion-based coping focus on acceptance, positive reinterpretation, and growth. These types of emotion-focused strategies may be productive. For example, forgiveness, an emotion-focused coping mechanism, has been associated with reduced health risk and increased health resilience.18

Carver and colleagues (1989) have proposed a more theoretically derived measure of coping behaviors called the COPE that measures 13 conceptually distinct coping strategies—three active coping strategies (active coping, planning, and suppression of competing activities), three avoidant coping strategies (denial, mental disengagement, and behavioral disengagement), three social support strategies (seeking social support for emotional reasons, seeking social support for instrumental reasons, and focus on emotion), as well as acceptance, restraint coping, and positive reinterpretation and growth.19 Seeking social support, acceptance, restraint, and positive reinterpretation and growth are certainly useful strategies in some contexts. However, most research has focused on the active coping and avoidant coping factors. Studies have shown that active coping leads to reduced distress and more positive outcomes, whereas avoidant coping is associated with increased depression.11,12

Trouble with everyday thinking skills is a significant stressor for patients with neurological disorders. Coping with these challenges effectively can mitigate the likelihood of becoming depressed. For example, research demonstrates that coping moderates the relationship between cognitive dysfunction and depression in MS patients, with high levels of avoidant coping and low levels of active coping leading to depression for the most impaired MS patients.11,12 This latter research suggests that clinicians should be forthright in discussing cognitive deficits with their patients, discourage avoidance and focusing on developing active coping strategies for dealing with specific cognitive deficits.

In addition to helping patients adjust to cognitive problems, it is also possible that coping style could minimize the influence of other neurological symptoms on cognitive functioning. Research on cognitive reserve has demonstrated that there are a variety of lifestyle factors that intervene in the relationship between neuropathology and cognitive decline.19,20 Most studies of cognitive reserve focus on premorbid lifestyle factors, however,
coping behaviors employed in response to illness may also play a role in patients’ level of cognitive impairment. One study showed that MS patients with high levels of fatigue were more likely to experience cognitive impairment when they utilized avoidant coping strategies.21

It is important to note that cognitive deficits may have a direct effect on patients’ ability to execute adaptive coping strategies. Appraisal of stressors, evaluation of resources, and enactment of coping behaviors are cognitively demanding tasks. Hence, cognitive deficits may result in a diminished ability to use active coping strategies, and a concomitant increased reliance on maladaptive coping styles, such as denial and avoidance. One study found that TBI patients were more likely to use planful problem-solving coping if they had higher levels of executive functioning, whereas poorer executive performance was predictive of escape avoidant coping.22 Our work has also demonstrated that coping is a key intervening factor in the relationship between cognitive dysfunction and depression in patients with MS. Lower levels of active coping, in conjunction with a relatively greater reliance on maladaptive avoidant coping, was related to depression symptoms.12

Patients with significant cognitive deficits are at higher risk for depression, and may have difficulty employing active coping strategies as a result of their disability. Research suggests that psychotherapeutic interventions, like Cognitive Behavior Therapy (CBT), are promising treatments for depressed patients with neurological disorders, such as MS, TBI, and stroke, however more research is needed.23-25 Learning and practicing coping skills in session may relieve much of the cognitive burden individuals face when coping with unfamiliar or unanticipated stressful situations. CBT may be a particularly appropriate therapeutic intervention for neurologically impaired individuals—it is behaviorally oriented, time-limited, active and directive, and focused on current problems. In order to increase treatment efficacy, therapists may need to augment traditional CBT interventions to make them more accessible to cognitively compromised clients. Such treatments have been developed, and they focus greater emphasis on behavioral techniques, expansion of positive social interactions, and modeling of assignments by the therapist. Developing a therapeutic alliance with a spouse or relative is also encouraged.

For neuropsychologists hoping to improve quality of life for their patients, there are many lessons to be gleaned from the decades of research on stress and coping. Cognitive deficits are often related to depression in patients with neurological disorders. Active and problem focused strategies for coping with stress are associated with better adjustment and decreased likelihood of depression. As neuropsychologists, we can characterize cognitive deficits well and provide recommendations for coping with these impairments. The research on cognitive dysfunction and coping highlights the importance of providing active problem-oriented recommendations for managing patients’ disease-related stress. However, because cognitive deficits may impair clients’ ability to enact active coping strategies, neuropsychologists should also provide recommendations that take advantage of coping resources, while providing scaffolding in the form of social support or cognitive aides. Thoughtful attention to these issues in clinical practice has the potential to improve quality of life for patients with neurological disease.

Clinical Take Home Points:

1. Cognitive deficits are often related to depression in patients with neurological disorders.

2. Patients who use active, problem-focused, strategies for coping with neurological symptoms typically have better outcomes.

3. Long-term use of avoidance and denial are associated with depression and other negative outcomes, and patients with cognitive deficits are more likely to rely on these maladaptive strategies.

4. Neuropsychologists should be forthright in discussing cognitive deficits with their patients. To facilitate adaptive coping, clinicians can help their patients anticipate the challenges their symptoms will pose and develop proactive strategies for meeting and overcoming these challenges.
Amanda Rabinowitz, Ph.D. is an Institute Scientist at Moss Rehabilitation Research Institute in Philadelphia, PA. She earned her Ph.D. in clinical psychology from the Pennsylvania State University, and completed her clinical internship in neuropsychology at Brown's Alpert School of Medicine. She recently finished a National Institutes of Health Postdoctoral Individual National Research Service Award at the University of Pennsylvania studying the role of neuronal injury in concussion related cognitive deficits.

References
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Over the last 15 years, positive psychology has emerged as a novel and viable subfield of psychology focused on positive aspects of human behavior and personality. This area has grown tremendously as evidenced by an ever-expanding literature, devoted conferences, and a robust community of scholars and practitioners.² Positive psychology has also influenced other areas, including military psychology, clinical psychology, and the business community.

Despite its growth within and beyond psychology, positive psychology has had a less noticeable impact on neuropsychology. Analysis of 10-year publication trends from 1999-2009 in three prominent neuropsychological journals (Archives of Clinical Neuropsychology, Journal of the International Neuropsychological Society, Neuropsychology) indicated that published research in neuropsychology focuses primarily on documentation of cognitive deficits, with few studies examining factors that relate to promoting cognitive health.² While an updated review of studies published in 2014 indicated a shift toward more research related to cognitive health,³ there remains a pressing need for neuropsychologists to consider orienting toward cognitive health in their academic and clinical work. This need has led to the emergence of positive neuropsychology—a practice and academic orientation focused on the study and promotion of cognitive health.

Six key domains of positive neuropsychology have been delineated.³ Four of these are particularly relevant for clinical practitioners in the field, as summarized by the “CAPE” model, corresponding to Compensatory strategies, Activity engagement, Prevention of cognitive dysfunction, and Educational efforts in the general population related to cognitive health (see the Patient Corner in this issue for further discussion of this model). Two additional domains are particularly relevant for those investigating scientific aspects of cognitive health: studying patients with positive cognitive outcomes and understanding normal and above normal cognition. I elaborate on these six domains below:

1. Cognitive and emotional compensatory strategies

Various compensatory strategies can serve to promote cognitive health. Cognitive compensation generally falls into two broad categories: external and internal strategy use. External strategies include memory and organizational aids and environmental modifications. Common strategies in this category include appointment books, pill boxes, prioritized lists (ideally with task-specific time estimates), smartphones, bill payment systems, and academic/test-taking supports. Internal strategies are self-generated techniques used to manage new material; these include task verbalization, infusing material with personal associations or context, “unitasking” rather than “multitasking,” and more generally, actively rather than passively processing new information.⁴ Further, emotional compensatory strategies, including use of active coping strategies and perceived emotional support, can promote cognitive health in patient populations and more generally.⁵,⁶

2. Physical, social, and intellectual activity

Another domain to consider vis-à-vis cognitive health is activity engagement. The “activity triad” is particularly compelling in this regard: physical/aerobic, social, and intellectual activity. Physical activity has been consistently associated with neuronal growth and cognitive enhancement across the lifespan.⁷ It is also now known that social engagement, including frequency of social activity and size of social network, has neuroprotective effects and promotes cognitive health.⁸,⁹ Further, intellectual activity (including doing crossword puzzles, reading, and going to museums) is linked to cognitive enhancement, and emerging evidence suggests that such activity may delay the onset of dementia.¹⁰ Reviewing with patients the cognitive benefits of activity engagement may serve to bolster motivation to make positive lifestyle changes.

3. Prevention efforts to maintain optimal cognition

An additional aspect of positive neuropsychology relates to efforts to prevent or minimize cognitive dysfunction. Regarding dietary habits, the Mediterranean diet has been shown across various cross-sectional, longitudinal, and intervention studies to promote cognitive wellness.¹² Adequate sleep—typically defined as 7-8 hours per day—has cognitive benefits, whereas sleeping more or less than this amount can lead to attentional, processing speed, and other problems.¹¹ An infrequently addressed lifestyle factor in neuropsychology is smoking, despite a fairly robust literature indicating negative effects of smoking on cognition across the lifespan and cognitive improvement upon smoking cessation.¹⁴ Other preventative efforts relate to effective management of concussion sequelae to ensure optimal recovery; related legislation in many states prevents athletes from participating in sports before concussion symptoms have fully remitted.¹⁵

4. Public education and advocacy

Public education in neuropsychology—the process of clarifying to the general public who we are as neuropsychologists, how we differ from other health care professionals, and elucidating brain-behavior relationships in accessible ways—is of critical
importance to the field. For example, over an approximately 10-year period, surveys administered to lay people across multiple North American cities indicated essentially no substantive changes in public understanding of brain injury and recovery. Primary care providers have indicated that they often learn about cognitive health online or through popular media, rather than from neuropsychologists or others with expertise in brain-behavior relationships. Public education efforts take many forms, including public speaking, media interviews, web-based or newspaper articles, and outreach to local schools and community groups. NAN has engaged in important related efforts, producing neuropsychology-oriented public education materials for practitioners to use in schools and for athletes and allied sports professionals.

5. Positive cognitive outcomes

While practitioners and researchers in neuropsychology typically focus on characterizing symptoms and deficits in various neuropsychiatric conditions, there is also value in better understanding patients with positive cognitive outcomes. One example to consider is multiple sclerosis: whereas approximately 50% of individuals with MS are known to have cognitive impairment, little is known about those without such deficits. It is also evident that some patients with mild cognitive impairment do not progress to dementia and that patients with neurologic disease often have islands of intact cognition. Our field may glean important empirical perspectives from other behavioral research focused on positive outcomes (e.g., long-term maintenance of weight loss; marital satisfaction). Related ideas could be used to derive new research paradigms aiming to comprehensively understand neuropsychiatric patients who show cognitive improvement, stability, or lack of impairment.

6. Normal and above normal cognition

Neuropsychology has a rich history of case studies related to cognitive dysfunction, although less is known about normal and impressive cognition. Luria described an early case of an individual with exceptional episodic and working memory who also experienced notable synesthesia. More recently, research examining individuals with ostensibly superior memory functioning has actually clarified what could be considered remarkable executive functioning. A better understanding of those with robust cognitive functioning could further inform rehabilitation efforts with tangible strategies and interventions. The study and promotion of cognitive health is a growing area of interest among neuropsychologists and the broader health care community as seen in the neuropsychological literature, organizational efforts, and conference proceedings (including the inaugural SuperBrains positive neuroscience conference hosted earlier this year). Neuropsychologists are well poised to offer meaningful contributions to this area in clinical settings and through novel research paradigms.

Clinical Take Home Points:


2. Consistent physical/aerobic, social, and intellectual activity promotes cognitive health across the lifespan.

3. Prevention of cognitive impairment or additional cognitive decline takes many forms, including healthy sleep, dietary, and exercise habits; avoiding smoking; and effectively managing concussion sequelae.

4. Many individuals harbor misconceptions about the brain, cognition, and brain injury/illness, and public education in neuropsychology is critically needed. Related efforts include speaking engagements, social media activity, newspaper articles, and media interviews.
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