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Psychology's Contribution to the Well-Being of Older Americans

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In concert with 6 decennial White House Conferences on Aging, psychologists have considered how developments in psychological science can contribute to the well-being of older Americans. We suggest 5 illustrative areas of psychological research: Advances in neuroscience elucidate ways to promote healthy cognitive aging; associated developments in neuropsychological assessment can help in protecting older Americans with cognitive losses from financial exploitation, abuse, and neglect. Psychological research on decision making and behavioral economics has much to offer to planning for retirement security and reducing vulnerability to financial abuse. Psychological research on self-management and behavior change can contribute importantly to enhancing good health behaviors among older adults; similarly the power of context on behavior can be harnessed in long-term care settings. Psychological research on attitudes and stereotypes gives insight into age bias that can be detrimental to healthy aging. Adaptive technologies and information technologies are beginning to transform assessment in research and clinical settings; technology also holds the promise of improving long-term support for older adults in both institutional and community-based settings. Finally, with 1 in 7 Americans now ages 65 and older, compared with 1 in 11 50 years ago, the psychology workforce—including health services providers and faculty to train those providers—is insufficient to meet the challenge of the aging population.

Keywords: aging, health services needs and demand, decision making, habits, stereotyping

The United States of America is an aging country in an aging world. The population ages 65 and older is the fastest growing segment of the U.S. population. A person turning 65 in 2015 can expect to live an additional 19.3 years on average, almost 5.5 years longer than someone turning 65 in 1950 (U.S. Census Bureau, 2014). At the same time, there are subgroup differences in longevity and in "healthy life expectancy" (Olshansky, 2015). Women represent more than 60% of those 85 and older, but also have more years with chronic illnesses and disabilities than older men. The older population is also increasingly diverse. Older minority adults comprised 20.7% of all American older adults in 2012 and are projected to reach 39% in 2050 (U.S. Census Bureau, 2012). In addition, the foreign-born population ages 65 and older is projected to increase by over 300% between 2014 and 2060, compared with the same-aged native-born population that is projected to increase 77% (U.S. Census Bureau, 2012). Diversity in sexual orientation and gender identity can be expected to become more recognized. Nearly half of all U.S. older adults are "economically vulnerable," defined as having an income that is less than two times the supplemental poverty threshold, with racially and ethnically diverse older adults experiencing poverty at a disproportionate rate (Economic Policy Institute, 2013). These patterns highlight the need for greater contribution by psychology to the well-being of older Americans.

For more than 50 years, psychologists and the American Psychological Association (APA) have carried out a number of key initiatives to focus attention on processes of aging. Moreover, 2015 marked the 50th anniversary of major legislative efforts designed to prepare for an aging America: Medicare, Medicaid, and the Older Americans Act (1965).

Editor's note. This article is one of nine in the special issue, "Aging in America: Perspectives From Psychological Science," published in *American Psychologist* (May–June 2016). Karen A. Roberto and Deborah A. DiGilio provided scholarly lead for the special issue.

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It was likewise the 80th anniversary of Social Security. In addition, the 2015 White House Conference on Aging (WHCoA), a decennial event, provided the opportunity to consider past, current, and future policy initiatives in an aging America. As the timeline in Table 1 reflects, there have been six WHCoAs, beginning in 1961. During this time, there have been a series of efforts to enhance psychology's contribution to understanding aging in individuals, families, and communities.

When the initial WHCoA was convened, one in 11 Americans were 65 and older, compared with one in seven today. The conference focused on nursing homes and health care, retirement income, housing, and governmental organization of services for the aged. Medicare and the passage of the Older Americans Act emerged from the 1961 WHCoA. The 1971 WHCoA catalyzed the establishment of the National Institute on Aging. The most recent WHCoA emphasized issues that represent both continuity and change from earlier conferences:

> How to ensure we prepare for financial needs in retirement; how to remain healthy as we age; what types of services and supports can help older Americans remain independent in the community as we age and how to support this care and the caregivers who provide it; and how to protect older Americans from financial exploitation, abuse, and neglect. (2015 WHCoA)

Each of the articles in this special issue focuses on some aspect of the 2015 WHCoA themes. In this opening article, we consider developments in the field of psychology and opportunities for psychological research to contribute to the well-being of older adults as captured by these four themes.

Table 1
A Timeline of Developments on Psychology of Aging and White House Conferences on Aging

Year	Event
1945	Founding of Division 20 (Division on Maturity & Old Age) within the American Psychological Association (APA)
1956	*Psychological Aspects of Aging* (Anderson, 1956), the first volume on aging published by APA
1961	The first White House Conference on Aging (WHCoA)
1971	The second WHCoA
1973	*The Psychology of Adult Development and Aging* (Eisdorfer & Lawton, 1973), compilation of papers prepared by APA Task Force on Aging for the 1971 WHCoA, published by APA
1980	*Aging in the 1980s: Psychological Issues* (Poon, 1980), prepared as a research agenda for the 1981 WHCoA, published by APA
1981	Mini-Conference on the Mental Health of Older Americans convened by the APA, American Psychiatric Association, National Association of Social Workers, and American Nurses Association
1981	The third WHCoA
1986	APA establishes a new journal, *Psychology and Aging*
1993	*Vitality for Life: Psychological Research for Productive Aging*, prepared under the auspices of the Human Capital Initiative, sponsored by the American Psychological Society, APA, National Institute of Mental Health, National Institute on Aging, Gerontological Society of America, and American Association of Retired Persons
1995	White House Mini-Conference on Emerging Issues in Mental Health and Aging
1995	The fourth WHCoA
1995	*Emerging Issues in Mental Health & Aging* (Gatz, 1995), compilation of the papers presented at the Mini-Conference, published by APA
1998	APA establishes the Committee on Aging (CONA) and the Office on Aging
2004	WHCoA Listening Session on Mental Health Issues hosted by APA in collaboration with the National Coalition on Mental Health and Aging
2005	The fifth WHCoA
2008	*Prolonging Vitality: Insights from Psychological Science* is developed by APA (APA, 2008)
2010	*The APA Family Caregivers Briefcase* (APA Presidential Initiative on Caregivers, 2010) is developed as an online resource
2012	The Institute of Medicine issues *Mental Health and Substance Use Workforce for Older Adults: In Whose Hands?* (Institute of Medicine, 2012)
2015	APA representatives attend WHCoA regional forums and APA submits white papers on each of the WHCoA priority issues
2015	The sixth WHCoA



Michael A. Smyer

We consider advances in neuroscience and assessment, decision making and behavioral economics, self-management and behavior change, understanding diversity and stereotyping in aging, and the impacts of technology on aging processes. We conclude by noting challenges in training sufficient professionals to meet the anticipated needs for care.

Neuroscience

Over the past 50 years, the study of psychology has been transformed by advances in neuroscience, with developments in neuroimaging now permitting researchers to quantify brain structure and use a variety of techniques to visualize brain function. For research in aging, one of the most significant techniques entails employing amyloid-labeling positron emission tomography tracers in order to image amyloid in the brain. Amyloid plaques are a central neuropathological hallmark of Alzheimer's disease, with amyloid accumulation beginning long before clinical symptoms of the disease (Adlard et al., 2014). Other key techniques include functional MRI (fMRI) studies based on the blood-oxygen-level-dependent effect, which detects parts of the brain that are relatively more active, and diffusion tensor imaging (DTI), which indexes white matter changes in areas such as the temporal lobe or hippocampus, providing an index of neuronal loss and axonal degeneration (Adlard et al., 2014).

Structurally, studies of older adults without dementia have shown that, on average, there are age-related volumetric shrinkages in the caudate, cerebellum, hippocampus, and prefrontal areas, whereas—as measured by DTI—prefrontal areas show the most white matter changes Park and Reuter-Lorenz (2009). These authors proposed a scaffolding theory of cognitive aging that argues that older adults engage compensatory circuitry in order to maintain cognitive function in the face of age-related brain losses. They further suggested that scaffolding is developed over the life span, is most available for overlearned skills, and can be fostered by factors such as physical fitness or appropriately challenging cognitive stimulation.

Brain health is a central aspect of healthy aging, with keen interest in identifying factors that promote healthy brain aging. In turn, neurocognitive losses may contribute to vulnerability, especially to financial abuse. The best established protective factors for brain health include physical exercise and meaningful engagement; the best established risk factors include midlife diabetes, midlife elevated low-density lipoprotein cholesterol, midlife hypertension, and stress (Hertzog, Kramer, Wilson, & Lindenberger, 2008; Mayeux & Stern, 2012). Of particular interest are studies showing that these factors correlate with neuroimaging or that interventions based on these factors lead to changes seen on neuroimaging. For example, the Experience Corps used older adults as volunteers with at-risk children in Grades K through 3, thereby increasing the older adults' physical engagement, cognitive engagement, and social interaction (Carr, Fried, & Rowe, 2015). The program had documented effects on older adults' health compared with a propensity-matched comparison group (Hong & Morrow-Howell, 2010), and, in a randomized control design, on cognitive functioning and fMRI-measured brain activity in the left prefrontal cortex and anterior cingulate cortex, suggesting brain plasticity and mental flexibility (Carlson et al., 2009). At the same time, however, questions remain about the "dose responsivity" of volunteering: How many hours of volunteering are required to produce the desired health outcomes (Carr et al., 2015)? Also, because brain health is the product of a lifetime of influences, when is it most important to intervene to promote healthy brain aging?

The aging of the U.S. population has meant an increase in the number of older adults with neurocognitive disorders. Advances in neuroimaging have led to better understanding relationships among brain networks, cognitive skills, and functional performance, including differences in brain regions affected by various neurodegenerative disorders (Moye, Marson, & Edelstein, 2013). Both normal cognitive aging and pathological changes associated with dementia affect older adults' ability to consent to medical treatment, make decisions about the management of their own health, make financial decisions, and consent to participation in research. Most importantly, it is recognized that changes are nuanced, and capacity is not an all-or-nothing state of affairs. In particular, even in the presence of memory losses, individuals may retain the values, opinions, and emotional memories formed over a lifetime.



Deborah A. DiGilio

Lichtenberg, Qualls, and Smyer (2015) suggest a framework for approaching capacity assessments that incorporates several key elements: contextual factors (e.g., psychological vulnerability; undue influence; history of exploitation), intellectual factors (ability to express a choice, provide a rationale, understand options, and appreciate the consequences of actions), and consistency of decisions with the older adult's previous values. Using this approach, Lichtenberg, Ficker, and Rahman-Filipiak (2016) assessed older African Americans' vulnerability to financial fraud and abuse. The authors found that those who were decisionally impaired were significantly more likely to suffer fraud than those who were not. Although the relationship between cognitive issues and financial decision making has been a topic of investigation, the link between these issues and financial exploitation has rarely been addressed and is explored in more depth by Lichtenberg (2016).

While acknowledging variability in definitions and standards across jurisdictions, the American Bar Association Commission on Law and Aging and the APA have collaborated on a series of handbooks to educate lawyers, judges, and psychologists in assessing older adults with diminished capacity (American Bar Association Commission on Law and Aging & American Psychological Association, 2005, 2006, 2008). In short, psychology's involvement in advances in neuroscience contributes to identifying ways to promote healthy cognitive aging as well as informing assessment of cognitive capacity in order to protect older Americans with cognitive losses from financial exploitation, abuse, and neglect.

Decision Science and Behavior Economics

The need to make decisions looms large in the lives of elders, as do implications of decisions made earlier in one's life. Healthier—or unhealthier—earlier choices about diet, smoking, alcohol, and other substance use affect health when older. Decisions about retirement, both early in one's career when saving for retirement, and decisions about when to retire and—for those with resources—how to allocate resources to annuities or other investments, affect financial well-being and security. Decisions also must be made about health insurance or whether to undergo a particular medical procedure, with a proliferation of choices as medical practice increasingly emphasizes shared decision making.

Psychological research about decision making has exploded in recent decades, with implications for our understanding of practical decision making in the lives of older adults. Of importance are both decisions earlier in life that can have consequences later as well as new decisions faced in old age. Various factors may lead to changes in decision making with age. For instance, Bruine de Bruin, Parker, and Fischhoff (2012) suggested that offsetting influences on decision-making competence may stem from, on the one hand, gains with age reflecting experience and improved emotion regulation and, on the other hand, losses related to normative decrements in fluid cognitive abilities (e.g., tests of perceptual speed or visual spatial ability). These researchers found that both resistance to sunk costs (i.e., choosing to discontinue an investment that is not paying off) and recognizing social norms improved with age.

Prospect theory, as formulated by Kahneman and Tversky (1979), focuses on the idea that people make decisions under conditions of risk and uncertainty based on their valuation of the prospects, that is, gains and losses, associated with each alternative. In framing choices, key observations included people's tendency to risk aversion, that is, the feeling that a loss matters more than a financially equivalent gain, and people's tendency to accept whatever option is designated as the default (Tversky & Kahneman, 1981). Bruine de Bruin et al. (2012) found that older adults were less proficient in both applying decision rules and resistance to framing (e.g., overcoming loss aversion). In both instances, lower proficiency was explained by poorer fluid cognitive ability. In a meta-analyses of age differences in risky decision making, Best and Charness (2015) found that when the choices were positively framed, older adults chose the sure option more often than younger adults. In a prior meta-analysis, Mata, Josef, Samanez-Larkin, and Hertwig (2011) reported older adults to be no more or less risk averse than younger adults if given explicit information about the degree of risk. However, when older adults faced a new decision in which they had to learn the likelihood of different outcomes through playing a game, older adults took longer to detect the better of gambles, thus choosing the risky alternative more often than younger adults.

Decision scientists have proposed interventions that leverage people's tendency to opt for the default, by designating defaults that represent the greater good, known as choice archi-

tecture (Thaler & Sunstein, 2008). This strategy has been employed to encourage greater retirement saving through setting up plans such that contributing to the plan is the default. The number of choices also matters. Iyengar and Kamenica (2010) found that giving more retirement investment choices led to less participation in a retirement plan and increased the attractiveness of simpler and potentially inferior options.

Building on prospect theory, health psychologists have asked when emphasizing the benefits of a behavior (gain frame) versus emphasizing the risks of not performing a behavior (loss frame) is more likely to lead to behavior change (Updegraff & Rothman, 2013). Building on older adults' preference for positive over negative information, Notthoff and Carstensen (2014) found that information about the benefits of walking, rather than the negative consequences of failing to walk, promoted increased walking among older adults.

Many decisions entail balancing consequences that will be realized at different times, either sooner or later. Studies of intertemporal choice have developed accounts of irrationality in decision makers' responses to situations pitting a larger, later reward against a smaller, sooner reward. The steepness by which delay diminishes the subjective value of the future reward is affected by the duration of the delay and the difference in value between present and future rewards (Ainslie, 1975). Additionally, self-regulatory depletion has been suggested to lead to preference for immediate over longer term rewards (Heatherton & Wagner, 2011). Age differences in delay discounting across adulthood are sometimes, but not always, reported, and are often explained by other variables such as health and survival probability (Chao, Szrek, Pereira, & Pauly, 2009), fluid cognitive abilities but not memory (Boyle et al., 2012), or one's ability to form a positive and vivid image of one's future self (Hershfield, 2011).

A final line of research relevant to judgment and decision making pertains to the information on which decisions are premised and the problems posed by misinformation (Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012). Examples of misinformation or outdated information that may form the basis for a decision include the beliefs that vaccination can cause autism, that the likelihood of getting a disease from smoking is small, or that aluminum causes Alzheimer's disease. Misinformation is especially powerful when it seems plausible, fits into the listener's world view, is shared by the listener's network of friends or media sources, or when the misinformation becomes familiar, for example, through repetition. Lewandowsky et al. (2012) describe the persistence of the misinformation despite retractions, including the possibility that the misinformation may become even more entrenched. Older adults proved even more susceptible to this effect than younger adults (Skurnik, Yoon, Park, & Schwarz, 2005), possibly because older adults are more likely to feel that something familiar is also true. Because debiasing may backfire, Lewandowsky et al. suggest circumventing retraction and instead using brief, simple, repeated statements of what is true as well as affirmation of the listener's world view and personal values.

In summary, psychological research on judgment and decision making can helpfully inform planning for retirement security, reducing vulnerability to financial abuse, enhancing healthy aging, and optimizing medical and long-term care. Implications for practice include referring to the older individual's prior experience, focusing on positive goals, providing clear information about risk, using good choice architecture in structuring choices and limiting options, and providing greater decisional support when there are cognitive limitations.

Self-Management and Behavior Change

Self-management and behavioral change are highly relevant concerns for older adults and their health. As for adults of all ages, older adults need to manage their drinking, smoking, and exercise behaviors. At the same time, new responsibilities may arise, such as adopting a low-salt diet or managing complex medication regimens. Psychological research on habits offers insights into these challenges. Habits are automatic responses in which a specific context becomes associated with a particular behavior. Habits are cued by contexts without requiring consideration of the goal of the behavior. Changing the context to remove the cues can break bad habits (Wood, Witt, & Tam, 2005), although studies by Quinn, Pascoe, Wood, and Neal (2010) concluded that the most successful self-control strategy was to stop the tendency to act on the habitual response through vigilant monitoring, which reduced the automaticity of the behavior. Developing new habits requires repeating the desired behavior in the same context with the same initial cue (Neal, Wood, & Quinn, 2006). Habit is little studied in older adults, although habit remains intact among healthy older adults and is a relatively preserved cognitive skill among older adults with dementia (Guerdoux, Dressaire, Martin, Adam, & Brouillet, 2012).

Context, automaticity, and behavior have been harnessed in designing behavioral interventions with older adults in the community and in long-term care settings. For example, Gardner et al. (2014) designed a randomized controlled trial, applying a habit formation model to reducing sedentary behavior in older adults, such as employing context-consistent repetition and reducing barriers that might trigger depletion. In a study of adherence to antihypertensive medications in patients whose average age was 68, habit strength was the strongest predictor of adherence, whereas beliefs in the efficacy of treatment mattered only in instances of intentional nonadherence (Phillips, Leventhal, & Leventhal, 2013). More generally, efforts to control behavior through context are consistent with Skinner's (1983) earlier emphasis on arranging the environment to adapt

to older adults' changing physical and intellectual abilities. In summary, psychological research on self-management can contribute importantly to healthy aging, and appreciation of the power of context can also be harnessed in long-term care settings.

Diversity and Stereotyping

The title of a recent Wall Street Journal article (Tergesen, 2015) highlighted the impact that social expectations and stereotypes can have on older adults' own expectations of aging and performance in later life: "To Age Well, Change How You Feel About Aging." The article drew on a growing literature from psychology and other disciplines exploring the impact of stereotypes on older adults and their well-being.

Being the target of stereotypes can have a negative impact on the performance of targeted individuals who become concerned that they may confirm the stereotype by poor performance, and do, indeed, perform poorly (Steele & Aronson, 1995). Importantly, the stereotypes need not be internalized and the individual need not believe the stereotype (Steele & Aronson, 1995). Stereotype threat can be activated explicitly by a direct statement of the negative expectation or implicitly when incidental external cues make individuals' membership in a particular group more salient.

Initially, the concept of stereotype threat was offered to explain race and gender disparities in academic achievement. Subsequently, the ideas have been usefully applied to older adults (Meisner, 2012). Recent work suggests that stereotype threat may affect older adults' conscious retrieval tasks but not implicit memory performance (Eich, Murayama, Castel, & Knowlton, 2014). Loss aversion may also matter. Barber, Mather, and Gatz (2015) have shown that effects of stereotype threat on mental status performance were evident when older participants were rewarded for correct answers, but that these effects were eliminated when the incentive was framed as loss-avoidance.

One suggested mechanism for the impact of stereotypes and stereotype threat is through incorporation of age stereotypes into older adults' subjective views of their future selves (Diehl et al., 2014; Kornadt & Rothermund, 2012). Levy (2009) suggests that stereotypes are internalized by older adults and become self-stereotypes that in turn predict worse memory performance, worse physical performance, reduced survival, and reduced self-efficacy. Levy, Pilver, Chung, and Slade (2014) have subsequently shown that an implicit-age-stereotype intervention with older adults can strengthen positive stereotypes, reduce negative stereotypes, and enhance physical function.

Ageism and implicit bias on the part of health care professionals may affect health care practice. Implicit attitude processes are negative or positive cognitions about a group or person that an individual holds subconsciously. Cuddy, Norton, and Fiske (2005) document an elderly stereotype that is widely found across cultures, which views the older adult as both warm (e.g., friendly, kind) and incompetent (e.g., incapable, having memory problems). This combination leads to others wanting to help but also to pity (Cuddy et al., 2005), a view of older adults consistent with incorrect assumptions that older adults have higher high rates of mental disorders than other groups or that dementia is a normal part of aging.

A major concern is that implicit biases among health care providers may contribute to health disparities. For example, surveys have shown that 35% of physicians consider an increase in blood pressure to be a normal process of aging, potentially leading to underdiagnosis and undertreatment (Hajjar, Miller, & Hirth, 2002), and that physicians are less likely to recommend physical activity to arthritis patients ages 65 and older than to patients younger than 65 (Austin, Qu, & Shewchuk, 2013). Randomized experiments have shown that practicing psychologists are less likely to see 70-year-olds as appropriate for psychotherapy as 35-year-olds with the same symptoms of depression (James & Haley, 1995), and that physicians were more likely to view suicidal ideation as rational and normal when the patient was 78 rather than 38 years old and therefore forego treatment (Uncapher & Areán, 2000).

As illustrated here, psychological research on attitudes and stereotypes gives insight into ageism and bias that can be detrimental to healthy aging. In addition to age, older adults belong to other categories defined by gender, race and ethnicity, sexual orientation, and disability. James and Haley (1995) found greater bias among mental health professionals toward those whose health was described as poor than toward those who were described as old. Because older adults are disproportionately women, ageism and sexism clearly intersect. Thus, psychological research on how identities intersect can inform training for the workforce who will serve older adults.

Technology

Those now old have lived through dizzying change in technology. The availability and pervasiveness of new technologies means that, increasingly, older adults will use technology to aid in adapting to their own aging, but also that technology will be used by formal and informal caregivers to older adults. O'Brien (2009) analyzed older adults' logs of technology use over a 10-day period and found that the average number of technology interactions ranged from 161 for self-classified "low" technology users to 301 for "high" technology users. Today—more than 5 years later—those interactions might encompass both simple and complex interface with technology, for example, medical-alert systems, social media, vacuum-cleaning robots, online

shopping, and patient portals to electronic medical records. Many of these technologies are available to all users, whereas some have been designed specifically to support older adults and their families.

Recent data from the Pew Research Center on Internet, Science, and Technology (Duggan, Ellison, Lamoe, Lenhart, & Madden, 2015) indicate that a majority of older adults who are online (56%) now use Facebook, representing about one third of older adults. This statistic is a reminder that there are generational differences among older adults (e.g., baby boomers vs. the GI generation) in their use of technology. In addition to generation, Czaja et al. (2006) reported that older adults' use of computer technology is mediated by cognitive abilities, computer self-efficacy, and computer anxiety. Similarly, Flynn, Smith, and Freese (2006) highlighted the importance of individual differences in health status and personality in predicting older adults' use of Internet resources to seek health information. There are two concerns to monitor: One is assuring that technology does not result in greater social isolation (e.g., Sharkey & Sharkey, 2012). The other is the need for education and ongoing technology support, particularly because, for example, use of a computer is increasingly required in order to access essential information and services.

Technology is also transforming psychological research and delivery of psychological services. Data collection by web-based surveys is common. Cognitive assessments for research and clinical use are increasingly conducted using computer adaptive testing. Mobile technologies are being enlisted to monitor everything from blood pressure to emotion, for both research purposes and to deliver health interventions (see Kaplan & Stone, 2013). Psychologists are part of the explosion of computerized brain fitness exercises and their evaluation. Psychologists are using virtual reality treatments, social robots, and other creative applications of technology for a range of special populations.

These advances in technology have much to contribute both to promoting healthy aging and to supporting those who need long-term-care services. Psychologists can have a key role in assuring that technologies are designed to appreciate individual differences in changing abilities of older adults, changing technologies, and the contexts in which technologies are used (Rogers & Fisk, 2010). As Rogers and Fisk (2010) point out, failure to appreciate these interacting factors can result in making tasks more difficult, rather than less difficult, and more frustrating to the older adult.

Establishing the effective role of technologies in long-term care is particularly crucial. The number of people in the United States who depend on long-term care will rise from 12 million in 2010 to 27 million in 2050 (U.S. Senate Commission on Long-Term Care, 2013). At the same time, following the *Olmstead* decision (1965) decision requiring the least restrictive care alternative, there has been a shift toward home and community-based care for those needing long-term care. For example, by 2011, of the $123 billion on long-term care spent by Medicaid, 45% went toward home- and community-based care, compared with 20% in 1995 prior to *Olmstead*, whereas nursing home care had dropped from 80% to 55% (U.S. Senate Commission on Long-Term Care, 2013).

Technology has been viewed as a way to help meet the needs for care posed by these rising numbers and as a way to support the shift to home-based care. For example, psychologists are involved in developing, implementing, and evaluating "cognitive orthotics"—assisting older adults with orientation, appointment and medication reminders, and step-by-step instructions for performing activities of daily living (International Federation on Aging, 2012). One key area for study has been medication compliance in older adults. Particularly for older adults with cognitive limitations or complex drug regimens, various electronic medication reminders are available. Pharmacy label design is another consideration, especially when there is low health literacy (Wolf et al., 2011). The best compliance and adherence models bring together engagement with the patient and health information technology, including incorporation of accurate medication data into electronic medical records and sharing information across care providers (e.g., Cutler & Everett, 2010).

One example of the needed intervention research is the personalized reminder information and social management system (PRISM) intervention by Czaja, Boot, et al. (2015). They have developed a software application to support social connectivity, memory, leisure activities, knowledge about topics, and access to resources. Ongoing randomized clinical trials are assessing the impact of the application compared with a standard computer tablet or a binder of information on similar topics. Outcomes include social isolation and social connectivity as well as computer proficiency, technology uptake, and attitudes toward technology.

There are clear financial incentives for technology companies to get involved in issues of aging. The U.S. market in assistive technology for older adults and people with disabilities, for example, is estimated to reach nearly $50 billion in 2015 (International Federation on Aging, 2012). However, there are significant barriers to effectively linking technology development and older adults' needs for assistance: the lack of integration of technology information (U.S. Senate Commission on Long-Term Care, 2013) and the reluctance of front-line, entry-level staff to be involved in the implementation and evaluation of new technologies (Freedman, Calkins, DeRosier, & Van Haitsma, 2005). For example, a recent report (Caffrey & Park-Lee, 2013) found that only 17% of residential communities (e.g., assisted living settings, but excluding nursing homes) used electronic health records, thereby limiting the ease with which they can share patient information with multiple settings and providers.

Further, at a time when health providers and organizations are implementing electronic health records (EHRs) to facilitate integration of care and patients' self-management of care, adoption rates for patient portals are approximately 25% (Czaja, Zarcadoolas, et al., 2015). Moreover, older adults are traditional "late adopters" of technology. For example, only about 18% of adults 65 and over use smartphones or tablet computers, with lower adoption rates among older and less affluent members of the cohort (Pew Research Center, 2014). In sum, adaptive technologies and information technologies are not currently being uniformly applied to provide the most effective support for older adults in either institutional or community-based settings.

One other area of emerging concern is older adults' possible vulnerability to fraud and abuse through application of technologies. The National Council on Aging (2015) includes Internet fraud among the top 10 financial scams targeting older adults. However, there have been no comprehensive studies of the interaction of age, generation, and individual differences in the impact of potential fraud or in the impact of prevention programs; this is an area that warrants further scrutiny.

Workforce

Continued contributions to the understanding and betterment of old age rely on a psychology workforce with the competence to meet older adults' needs and support their strengths through health services provision, research, and teaching. However, in psychology, as in other disciplines, the number of professionals working in or entering fields related to geriatric mental health and geriatric health care more broadly is disconcertingly small (Institute of Medicine, 2008, 2012). The urgency of the situation is only increasing because of the growing number of Americans living to old age and the aging of the psychology workforce itself.

This is not a recent concern. In 1971, the APA Task Force on Aging sounded warnings that "there is and will continue to be a striking shortage of psychologists to serve the public through direct clinical service, to perform basic research, and to educate others" (Eisdorfer & Lawton, 1973). These warnings have been repeated at least every 10 years.

Data from the APA Center for Workforce Studies (CWS) 2008 Survey of Psychology Health Service Providers (APA Center for Workforce Studies, 2010) indicate that an average of 8.5% of all psychologist health service provider time is being spent with adults over the age of 65. Only 4.2% of respondents identified geropsychology as an area of current focus. The CWS report also documents the aging of the psychology workforce. The median reported age of respondents was 55.

Although progress has been made in many areas, much more is needed to keep pace with the aging of the population and of the professionals to serve them. The 1971 Task Force set a 10-year goal that every institution of higher learning concerned with graduate education should have at least one psychologist competent to teach and conduct research on the psychological aspects of aging. Although we do not have data on the number of graduate faculty with competence in aging, we do know there are still relatively few opportunities for formal geropsychology training at the graduate level, with only 10 to 15 programs offering a special geropsychology track (Perry & Boccaccini, 2009). This results in limited opportunities for students to be exposed to aging, and perpetuates the dearth of specialists in geropsychology to supervise geropsychology students, to design continuing education programs, and to conduct creative applied research. The launching of the Council of Professional Geropsychology Training Programs has been particularly important in addressing this shortage by promoting high-quality education and training and resources.

Adults ages 65 and older are significant consumers of health care, responsible for 36% of all health-related expenditures (Institute of Medicine, 2012) and one third of physician visits—proportions that will increase as the proportion of older adults grows. By 2030, mental health and substance use conditions among older adults are predicted to increase by 80%, with the need for professional mental health services to treat these conditions (Institute of Medicine, 2012). Because the burden of chronic illness increases as one ages, psychologists' provision of services extends beyond mental health and substance use to include health promotion and chronic disease management; treating behavioral and psychiatric symptoms of dementia; capacity assessment; supporting family caregivers; behavioral interventions for pain, sleep, incontinence; and end-of-life care (APA, 2014). Integrating psychology into models of interdisciplinary practice and team-based care in health care settings has been an increasing focus because these models are particularly well suited to address the often complex and multidimensional needs of older adults (APA Presidential Task Force on Integrated Health Care for an Aging Population, 2008; Areán & Gum, 2013).

In collaboration with the Eldercare Workforce Alliance, APA secured language in the Affordable Care Act of 2010 (the Patient Protection & Affordable Care Act, 2010; the Health Care and Education Reconciliation Act, 2010) that expanded Health Resources and Services Administration funding for geriatric health professions education and training programs to include psychologists. The Geriatric Academic Career Awards and Geriatric Education Centers were expanded to include psychology faculty and graduate programs, and a new Geriatric Career Incentive Awards program was authorized and includes students of psychology. This source of funding provides additional impetus for expanding interprofessional graduate training in geropsychology beyond the Graduate Psychology Education Pro-

gram that supports training targeting underserved populations, including older adults.

Other efforts by psychologists have focused on older adults in the workforce (see James, Matz-Costa & Smyer, 2016). We know of no systematic data, but older psychologists who add geropsychology expertise through continuing education could help to address some of the shortages in geriatric mental health care. This trend might be encouraged and evaluated, including benefits for both older clients and older providers.

As the definition of the role of psychologists continues to evolve, funding becomes available, and psychologists are trained to work as members of interdisciplinary health care teams in primary care settings, psychologist involvement in the provision of care to older adults will also likely increase.

Conclusion

Over the last 50 years, psychologists have regularly focused attention on the impact of aging on basic psychological processes and with good reason: Psychology has much to offer older adults in an aging world, extending efforts such as the Social and Behavioral Sciences Team (https://sbst.gov/) to bring behavioral science to federal policy initiatives. In this article, we have illustrated this ongoing process with examples from five broad areas of psychology: neuroscience, decision making and behavioral economics, self-management and behavior change, attitudes and stereotypes, and the application of technologies to accommodate changing abilities in later life.

For nearly as long, psychologists have decried the dearth of specialists in geropsychology. Despite advances in the field—including modest expansion of training opportunities—there continues to be too few psychologists trained with expertise in adult development and aging. However, as this article has illustrated, psychologists who are concerned with research and teaching about basic psychological processes (e.g., the formation and maintenance of habits, the impact of stereotypes, human/technology interaction) can make important contributions to our understanding of older adults' adaptations in later life. Similarly, psychologists who are involved in the emerging roles of health care providers will inevitably test the relevance of their approaches for older adults and their families. In short, psychology has much to contribute to the understanding of aging and to the well-being of older Americans.

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