

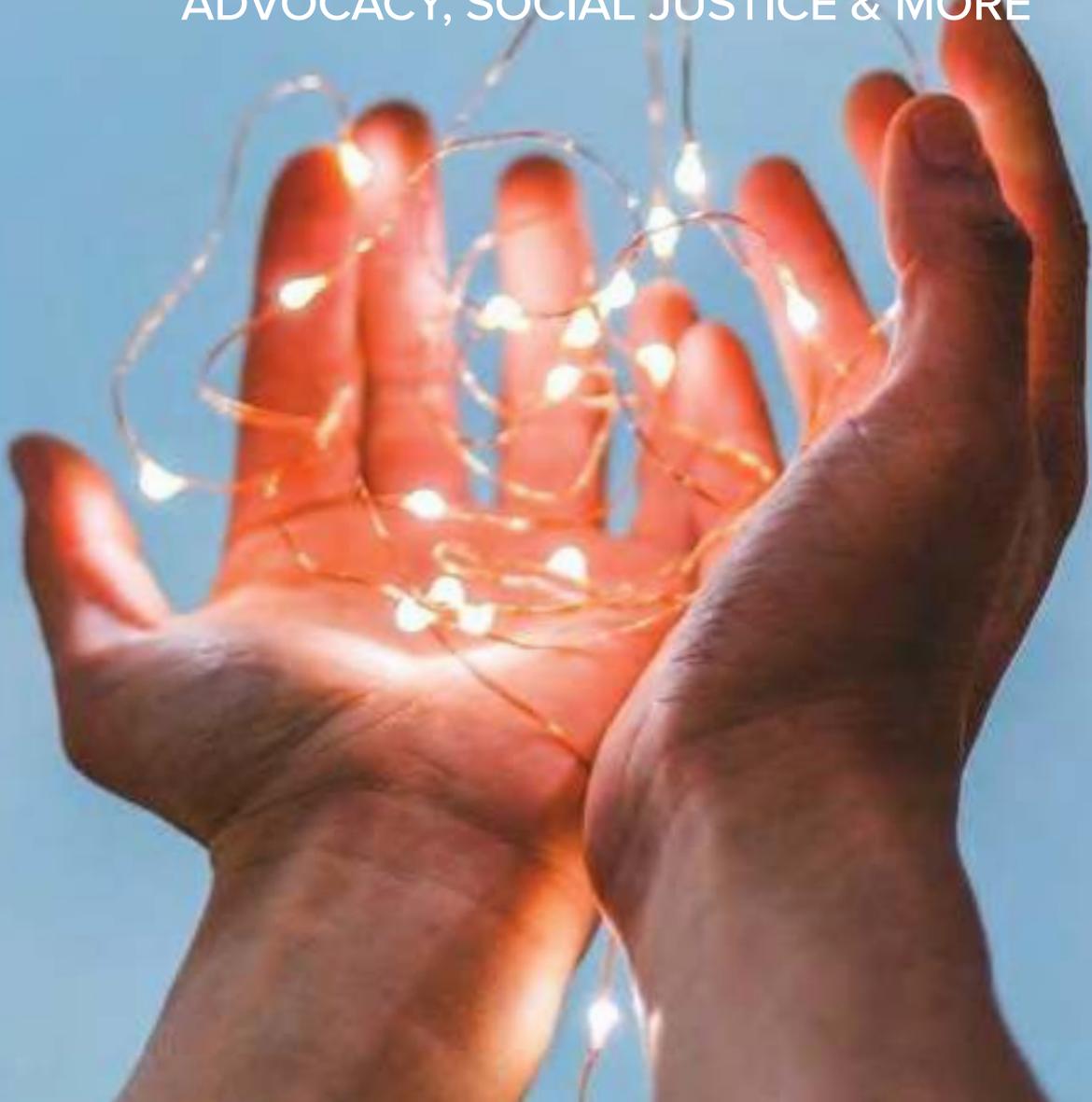


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monitor on
psychology

Trends Report

WHAT'S AHEAD IN 2018 FOR PSYCHOLOGISTS
IN TECHNOLOGY, RESEARCH, HEALTH CARE,
ADVOCACY, SOCIAL JUSTICE & MORE



10

TRENDS

TO WATCH IN

PSYCHOLOGY

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COVER: DIEGO PH/UNSPLASH

MORE THAN EVER before, there is a growing appreciation for psychologists' expertise, including the research they do to illuminate human behavior and the treatment and insights they provide to improve health and well-being. ¶ But of course the field's capabilities go far beyond research and practice—psychology's ever-multiplying subfields touch on every facet of life. ¶ Today's psychologists are the innovators improving American products and services, from self-driving cars to the health-monitoring apps on our cellphones. They are the trailblazers steering efforts that improve health outcomes and enrich the performance of teams in workplaces nationwide. They are the thought leaders advocating for critical causes, from women's rights to science-based public policy. ¶ In this special *APA Monitor* report, "10 Trends to Watch in Psychology," we explore how several far-reaching developments in psychology are transforming the field and society at large.



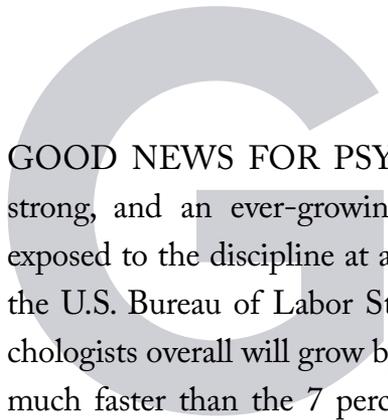
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1

PSYCHOLOGY IS MORE POPULAR THAN EVER

In a trend that bodes well for the discipline's future and the nation's health, the demand for psychologists—and psychology education—is robust **BY REBECCA A. CLAY**





GOOD NEWS FOR PSYCHOLOGISTS: Job prospects are strong, and an ever-growing number of Americans are being exposed to the discipline at all levels of education. ¶ According to the U.S. Bureau of Labor Statistics (BLS), employment for psychologists overall will grow by 19 percent between 2014 and 2024, much faster than the 7 percent average growth predicted for all occupations. In contrast, employment of psychiatrists is predicted to grow by just 15 percent and social workers by only 12 percent. ¶ Jobs for clinical, counseling and school psychologists are expected to grow even faster than employment for psychologists overall, with an expected 20 percent increase, spurred by the need for

services for older people with aging concerns, veterans with war-related trauma and people with autism, the BLS says.

In non-health service subfields, employment of industrial/organizational (I/O) psychologists is expected to grow by 19 percent. However, I/O psychologists can expect stiff competition, BLS warns, noting the mismatch between the large number of qualified applicants and the 400 or so new jobs expected in the field.

Overall, the unemployment rate for psychologists is low. According to the latest data from the National Science Foundation (NSF), in 2013, the unemployment rate for psychology research doctorates was 1.6 percent, lower than the 2.1 percent for research doctorate recipients in all science and engineering fields and 1.9 percent for research doctorate recipients in social science fields.

“A psychology doctorate is extremely

marketable because you develop valuable and transferrable skills, such as writing, communicating, investigating and understanding behavior, which will serve you well in many different employment settings,” says Peggy Christidis, PhD, senior research officer at APA’s Center for Workforce Studies (CWS).

MORE STUDENTS STUDY PSYCHOLOGY

Psychology’s educational pipeline is strong, too. The number of high school students taking the Advanced Placement psychology test, for example, has jumped from just 3,916 when the exam was introduced in 1992 to 303,000 this year. And that doesn’t include an unknown number of students—perhaps 50,000—taking the course but not the exam, says David Myers, PhD, author of a leading introductory psychology textbook and a

professor at Hope College in Holland, Michigan. It also doesn’t include students taking other psychology courses. According to U.S. Department of Education data, almost 30 percent of high school graduates in 2009—nearly a million students—had earned psychology credit.

Psychology’s popularity continues in college. Between 1.2 million and 1.6 million undergraduates take introductory psychology classes each year, according to estimates (*American Psychologist*, Vol. 71, No. 2, 2016).

Many of those students go on to become psychology majors. The share of college students majoring in psychology has hovered around 6 to 6.5 percent since the early 1990s, up from about 4 to 5 percent in the 1980s. That makes psychology the No. 1 major among specific fields within science and engineering—more popular than biological sciences, physics and astronomy, mathematics, electrical engineering, computer science, information sciences, the other social sciences and many other majors, according to NSF. Psychology is the fourth most popular individual major overall, behind business, health professions and related programs, social sciences and history, according to the U.S. Department of Education. In the 2014–15 academic year, schools awarded more than 117,000 bachelor’s degrees in psychology.

Meanwhile, graduate-level psychology education is surging. Between 2004 and 2013, the number of master’s degrees awarded jumped by 54 percent and doc-

torates by 32 percent, according to a CWS analysis of U.S. Department of Education data. In 2013, 58 percent of psychology master's degrees and 56 percent of doctorates were in health service provision subfields—clinical, counseling and school psychology. Doctorates in health service provision subfields are outpacing research subfields, growing by 34 percent versus 29 percent over the last decade.

A HEALTHIER SOCIETY?

All that education is paying off in a public that's more open to psychology. And that knowledge may have tangible benefits, says William T. Riley, PhD, who directs the Office of Behavioral and Social Sciences Research at the National Institutes of Health.

Even a psychology class or two, he

says, can give students the tools they need to make healthy behavior changes. "A few classes that train students to challenge and test their assumptions about their behavior and the behavior of others can provide the scientific grounding to be good consumers of health research and to be more effective at self-improvement, including changes in behavior that improve health," says Riley, noting that social and behavioral factors account for more than half of the burden of disease.

Certainly, more Americans are asking for help with mental health problems. According to data from the U.S. Substance Abuse and Mental Health Services Administration, the number of Americans seeking mental health services increased from 13 percent of adults in 2004 to 15 percent in 2014.

At the same time, psychological science is leading to interventions that are enhancing people's lives in a wide variety of areas, whether it's boosting educational performance, reducing distracted driving, improving work life or designing products and services to be more user friendly. All the while, a strong psychology education pipeline is creating the next generation of psychologists to continue that work and a population primed to understand it.

"The millions of students who have taken Advanced Placement psychology, in addition to the millions more taking intro to psychology at colleges and universities, represent our chance to contribute to human understanding and to a just and sustainable human future," Myers says. ■

Psychology is the fourth most popular individual major overall, behind business, health professions and related programs, and social sciences and history.



2

APPLIED PSYCHOLOGY IS HOT, AND IT'S ONLY GETTING HOTTER

Corporate America is increasingly in search of applied psychologists' skills **BY KIRSTEN WEIR**

SAMUEL KELLER/UNSPLOASH



AS TECHNOLOGY CHANGES the way we work, play, travel and think, applied psychologists who understand technology are more sought after than ever, says Anne McLaughlin, PhD, a professor of human factors and applied cognition in the department of psychology at North Carolina State University and past president of APA's Div. 21 (Applied Experimental and Engineering Psychology). ¶ The beauty of applied psychology is that it draws on fundamental research skills that will be relevant no matter how technology evolves. "Any work we do with new technology takes the human angle. We're doing research into human cognition," McLaughlin says. "Getting a handle on human capabilities and limitations will

help us now and will help us develop technology that doesn't exist yet." In other words, applied psychology is hot, and it's only getting hotter.

SMARTER SMART DEVICES

We now have smart devices that help us stay connected wherever we go, and smart vehicles that guide us safely to smart homes that turn on our heat and lights before we get there. But smart systems aren't so clever if they're too complicated to use. And that's where human factors psychologists can help, by drawing on their research skills and knowledge of human cognition and behavior to design products and systems that are easier and more enjoyable to use.

These psychologists have found, for example, that most people don't get around to programming their smart devices and systems, says Robert Proctor,

PhD, a professor of psychology at Purdue University specializing in human factors and human-computer interaction, and president of Div. 21. "If there's too much effort in figuring out the interface, you don't get the benefits," he says. That's an opportunity for applied psychologists, who can help design such devices in ways that make them easier and more inviting.

Human factors psychologists are bridging the gap between human and machine in many areas, including human-robot interactions, brain-machine interfaces and virtual reality systems, Proctor adds. Much of his own research focuses on cybersecurity—another area in which opportunities abound for psychologists, he says.

"Computer scientists describe humans as the weakest link in security," he notes. As experts in human behavior and judgment, psychologists can help cyber-

security companies predict how people behave online—and how to design safeguards that complement human behavior to protect our personal data.

Technology companies are hungry for insights on human behavior. While computer scientists can gather reams of data about how people use gaming systems, they aren't necessarily trained in how to interpret those data, says applied cognitive psychologist Tim Nichols, PhD, who has worked at Microsoft for 11 years, on the Xbox and HoloLens systems. "That's what behavioral research and psychology is all about, and that goal of deriving meaning makes industry today such a welcoming place for people who understand how to ask and answer questions in a rigorous way," he says. As part of research and development teams, psychologists can answer such questions as: How do people use speech recognition systems? What makes someone want to engage with a device? Does a new screen-display technology cause headaches? "We want to understand how people are perceiving and responding to these things, and to make sure the systems are engaging and comfortable to use," Nichols says.

While advances in technology are creating new opportunities for psychologists, advances in psychological science are also informing technology. In the last decade, the new field of "neuro-ergonomics" has emerged, McLaughlin says. Neuro-ergonomics applies tools and knowledge from neuroscience to design safer, smarter, more efficient human-

centered systems. Such systems might measure how a worker's brain becomes fatigued during different types of work, for instance, and adapt the amount of automation depending on the worker's attention levels and cognitive state. "We can use these physiological measures to build, adapt or choose the way someone interacts with technology," she says.

TRANSPORTATION AND HEALTH CARE

Human factors experts are also finding a wealth of opportunity in the transportation industry, says Carryl Baldwin, PhD, director of the human factors and applied cognition program at George Mason

University. Already there are vehicles that incorporate partial-automation systems, such as cars that parallel park themselves or slow down if you get too close to the car in front of you. And the race is on to push automation further. Ford is aiming to release a fully autonomous car by 2021, while electric car pioneer Tesla intends to launch driverless cars this year. "There's a large role for psychologists to work in those areas, now and for the foreseeable future," Baldwin says.

Her own research focuses on the design side, developing driver-vehicle interfaces that are intuitive and reduce the risk of accidents. "People aren't good at paying attention to things long-term

when they're not actively engaged," she says. "We need to figure out smart ways to keep people in the loop."

Psychologists will also increasingly play an important role in educating and training the public to use those systems, she says. "There's a great need for psychologists to help the public develop an appropriate mental model of how automated systems work, and to appropriately calibrate their trust in the systems so they're not afraid or overly confident."

Changes in the health-care sector are also driving the demand for applied

Human factors experts are finding a wealth of opportunity in the transportation industry.



DKART/ISTOCKPHOTO



Psychologists can determine what factors help engage users on a smartphone.

psychologists. In 2016, the U.S. Food and Drug Administration issued a guidance that manufacturers integrate human factors into the testing process when developing new medical devices. Whether the user is a physician trying out a new robotic surgical tool or a patient operating an at-home glucose monitor, such pre-market testing can make an important difference for patient safety.

Human factors psychologist Arathi Sethumadhavan, PhD, has found almost limitless opportunities in the health-care field since finishing her graduate degree in 2009. Though her background was in aviation, she found her human factors skills transferred easily to the medical sector—and those skills have been in demand.

Sethumadhavan worked for several years at the medical device manufacturer Medtronic, optimizing the design of cardiac devices. Now she's working as a consultant, advising companies around

the globe on projects including dialysis machines, insulin patches and smartphone apps for health management.

Because the FDA and other regulatory agencies take user-centered design so seriously, she says, device manufacturers are keen to embrace the skills that psychologists bring to the team. As a consultant, it can be challenging to jump from project to project, and manufacturers' timelines often mean she has to plan studies that can be completed much more quickly than they might in an academic setting.

"You have to be agile," she says. But it's worth the effort. "By optimizing human-machine interaction, I can make things better for physicians, nurses and patients."

In other attempts to improve patient safety, psychologists are applying their research skills to systematically study hospital and health-care errors. Much like psychologists of previous generations

who studied aviation errors to make plane travel safer, today's human factors researchers are using their expertise to look for gaps in communication that can lead to medical errors and devise systems that minimize such mistakes. "It's one of the dominant areas of human factors right now," Proctor says.

Despite the proliferation of industries that are tapping the skills and knowledge of psychologists, there's even more the field could be doing to solve the practical problems of modern life—not only in technology fields, but in research related to sustainability and globalization as well.

"Too often, companies don't bring in a human factors specialist until something has gone catastrophically wrong," Baldwin says. "Most people still think 'psychology' is clinical therapy, and they don't understand the many roles psychologists can play. We need to do a better job of educating the public about what we can do." ■

3 TARGETING SOCIAL FACTORS THAT UNDERMINE HEALTH

Psychologists are playing expanded roles in addressing how poverty, lack of decent housing and other environmental factors influence health outcomes **BY TORI DEANGELIS**



A GROWING NUMBER OF PSYCHOLOGISTS are working to tackle the “social determinants of health”—how poverty, family discord, community violence, barriers to care and other environmental and developmental stressors undermine physical and mental health. ¶ “Current efforts to improve our health-care system have reinvigorated the discussion around the critical role of social determinants in improving health and well-being,” says psychologist Sandra Wilkniss, PhD, program director for the National Governors Association (NGA) Center for Best Practices Health Division. ¶ In one of the most significant federal investments to address social determinants, this year the Centers for Medicare and

Medicaid Services is providing more than \$8 million to 32 social service, health-care and business organizations that will serve as community hubs to test service-delivery approaches related to these factors. Known as the Accountable Health Communities Model, the effort aims to improve coordination between clinical and community services so they better serve the health-related social needs of Medicare and Medicaid recipients in such areas as housing, food security, utility payments and transportation.

On the state level, the NGA—the group that gives state governors a broad forum for sharing best practices and coordinating initiatives—has launched several programs to address various social determinants of health, including housing. Psychologists’ work in the area includes:

CREATING INNOVATIVE PROGRAMS

Research shows that securing good housing for homeless people on Medicaid can catalyze other positive outcomes, including better health. “The notion is that the best way to help someone in high need is to first get them a house, a roof over their head,” says Wilkniss.

In her position at the NGA, Wilkniss has had a major hand in developing “Housing as Health Care: A Road Map for States,” that helps states develop, implement and evaluate programs that provide access to housing, job assistance, and mental health and substance abuse care. To date, the NGA has worked with 10 states and one territory to implement the plan.

Wilkniss says that while all of the program’s services help this population, the main ingredient for their success has been

securing housing. “Many people actually do very well comprehensively in their lives after getting housing first,” she says.

In Philadelphia, Arthur C. Evans Jr., PhD, now APA’s chief executive officer, enacted a range of successful programs using a social determinants framework when he served as commissioner of Philadelphia’s Department of Behavioral Health and Intellectual disAbility Services between 2005 and 2017. One program used large-scale art projects, storytelling and mental health training to educate community members about how community-based trauma can affect people’s mental health and substance use. Another program secured housing for 800 previously homeless people. Once in those new environments, these individuals’ clinical status improved and their behavioral health costs dropped dramatically, Evans says.

“If we want to help people, it’s really important to understand them within their social contexts,” says Evans. “We can treat people over and over again, but unless we can get them into stable housing or address other environmental needs they may have, treatment alone doesn’t help improve their health outcomes.”

OFFERING PRACTICAL HELP

Another effort is applying a social determinants model in work with patients who have HIV/AIDS, many of them poor, minority or both. University of Virginia assistant professor Amit Shahane, PhD, and his team first assess the challenges of these clients, asking them about their

In addition to offering practical help, psychologists are also incorporating more questions related to social determinants of health in their research.



ability to pay medical bills, their levels of community support, and their degree of knowledge and comfort with medical terminology, for example. The team then uses this information to tailor treatment and identify solutions for patients' practical treatment challenges, such as hiring community health workers to bring patients who lack transportation to health-care appointments. Interventions like this are critical because they boost patient adherence to HIV/AIDS treatments. "Addressing social determinants of health, such as lack of transportation, increases these patients' access to health services and contributes to overall better health outcomes," Shahane says.

PURSUING NEW RESEARCH

Psychologists are also incorporating more questions related to social determinants into their research. Fuller Theological Seminary associate professor Lisseth Rojas-Flores, PhD, for example, is examining how parents' immigration

status and immigration enforcement may affect children's psychological well-being. In her research, she found significantly higher rates of post-traumatic stress symptoms among children of detained and deported parents than in youngsters whose parents were either legal permanent residents or were undocumented but hadn't been contacted by immigration enforcement (*Psychological Trauma: Theory, Research, Practice, and Policy*, Vol. 9, No. 3, 2017).

IMPROVING ASSESSMENT

Other psychologists are developing tools to better capture the social and environmental stressors in clients' lives. Researchers at Tufts University School of Medicine, for example, have developed a screening instrument for pediatricians that assesses children's developmental milestones and social and emotional functioning, as well as parental problems such as depression, substance abuse, discord, hunger and more. The "Survey

of Well-being of Young Children," or SWYC, is available for free online.

The tool is meant to assess the whole child in his or her environment and is intended for use with children of any socioeconomic class, since many social determinants—such as maternal depression, substance use and domestic violence—are not class-specific.

Such technological advances promise to make social determinants data more useful, says Chris Sheldrick, PhD, who created the tool with developmental behavioral pediatrician Ellen Perrin, MD. Once data from the SWYC are incorporated into pediatricians' electronic medical records, for instance, it will be easier to aggregate large sets of patient data related to these factors.

"We'll be able to generate data that can be used for public health research, population health monitoring and other information that can help improve public health and mental health," he says. "And that is going to be a game changer." ■

4 PSYCHOLOGISTS ARE STANDING UP FOR SCIENCE

The field is redoubling its efforts in the face of increased threats to science and science policy. Grassroots advocacy is springing up in cities and on campuses nationwide.

BY LEA WINERMAN

VLAD TCHOMPALOV/UNSPASH



PSYCHOLOGISTS HAVE a long history of advocating for science and education funding and better access to mental health care. But this year, at a time when science funding—and science-based policy—is perhaps more imperiled than ever, more psychologists are making their voices heard. ¶ The White House budget proposal for 2018, released in May, would slash \$7.2 billion (21 percent) from the National Institutes of Health budget, \$820 million (11 percent) from the National Science Foundation, and nearly \$400 million from the Substance Abuse and Mental Health Services Administration, among many cuts that APA opposes. ¶ Scientists are also concerned by the number of high-level science positions

in the federal government that remain vacant. A June report in *The Washington Post* found that 85 percent of top science jobs at federal agencies remained unfilled (without even a nominee)—a far higher percentage than in previous administrations.

In April, more than 300 psychologists joined APA at the March for Science in Washington, D.C. Untold numbers more participated in satellite marches around the country. The march was the most visible indication of an uptick in interest in science advocacy among psychologists, according to Pat Kobor, senior science policy analyst in APA's Science Directorate. "Our members are very sensitive to the extent to which the administration is listening to scientists and basing decisions on data," Kobor says. "People are paying closer attention than they normally might."

With threats like these in mind, Cady

Block, PhD, has found herself newly drawn to public advocacy. Block, a clinical neuropsychologist and assistant professor at the Ohio State University Wexner Medical Center, independently launched and ran the Twitter campaign for the Columbus, Ohio, March for Science, one of more than 100 satellite marches, which itself drew more than 5,000 participants.

Dawn Huber, PhD, an assistant clinical professor in the University of Missouri department of health psychology, helped organize members of the Missouri Psychological Association to participate in the march in Columbia, Missouri. For her, a highlight was joining with researchers from many other fields.

"People came together from really diverse places—physics, astronomy, biology," she says. "So, for me, it was a great opportunity for psychology to step

up and say, 'Hey, we're a part of this, too.'"

The challenge now, says Kobor, is to follow up on the enthusiasm generated by the march and channel it into continuing advocacy efforts.

"The march was so important for public awareness," she says. "To move the needle, you have to do the regular shoe-leather advocacy. You have to let policymakers know you pay attention and you care."

To that end, Kobor and other APA Science Directorate staff led a live and web-streamed advocacy training session before the march. APA's Office on Early Career Psychologists (ECPs) also held two advocacy training sessions over the summer with the Public Interest Directorate's Government Relations Office—a webinar in June on how to conduct visits with federal officials, and a postconvention event in August to connect interested ECPs with psychologists already involved in advocacy.

Interest in these kind of trainings is up among APA members, says Amalia Corby-Edwards, senior legislative and federal affairs officer in the Public Interest Directorate. Corby-Edwards recommends that those who want to stay abreast of the association's advocacy efforts should join the APA Federal Action Network for updates and action alerts.

Meanwhile, grassroots advocacy efforts are springing up at campuses as well. Will Adler, a graduate student in neuroscience at New York University, started a group called the Scientist Action and Advocacy Network (ScAAN) at NYU after



APA members at the March for Science.

the 2016 election. The group—mostly NYU psychology and neuroscience grad students and faculty—provides volunteer data analysis, literature reviews and other expertise for social justice groups that aim to influence policy.

“Many scientists, especially psychologists, hope that their research will have a positive impact on the world. But the process can feel slow, and sometimes scientists feel like that’s someone else’s job,” says Adler. “We want to increase the role of scientists in policymaking directly.”

In one of their first projects, ScAAN members wrote a literature review for an advocacy group that aimed to change a New York state policy that required all 16- and 17-year-olds to be tried in

criminal court as adults. (The new law passed in April.)

Advocacy does not always come naturally to psychologists, says Huber—especially when it expands beyond advocating for research funding to include advocating more broadly for research-based public policy positions.

“Because of our theoretical training, psychologists can feel hesitant, or like it’s inappropriate for us to publicly voice opinions in these matters. But especially in areas where we are relying on our expertise, it’s really not a partisan issue,” she says. “I work in pediatrics—if we can’t speak up for kids, what can we speak up for?”

Psychologists are not the only ones

to struggle with these issues. The march prompted a lively debate among scientists over whether such advocacy could hurt their nonpartisan credibility with the public.

For many, though, that risk is worth taking—as scientists and citizens.

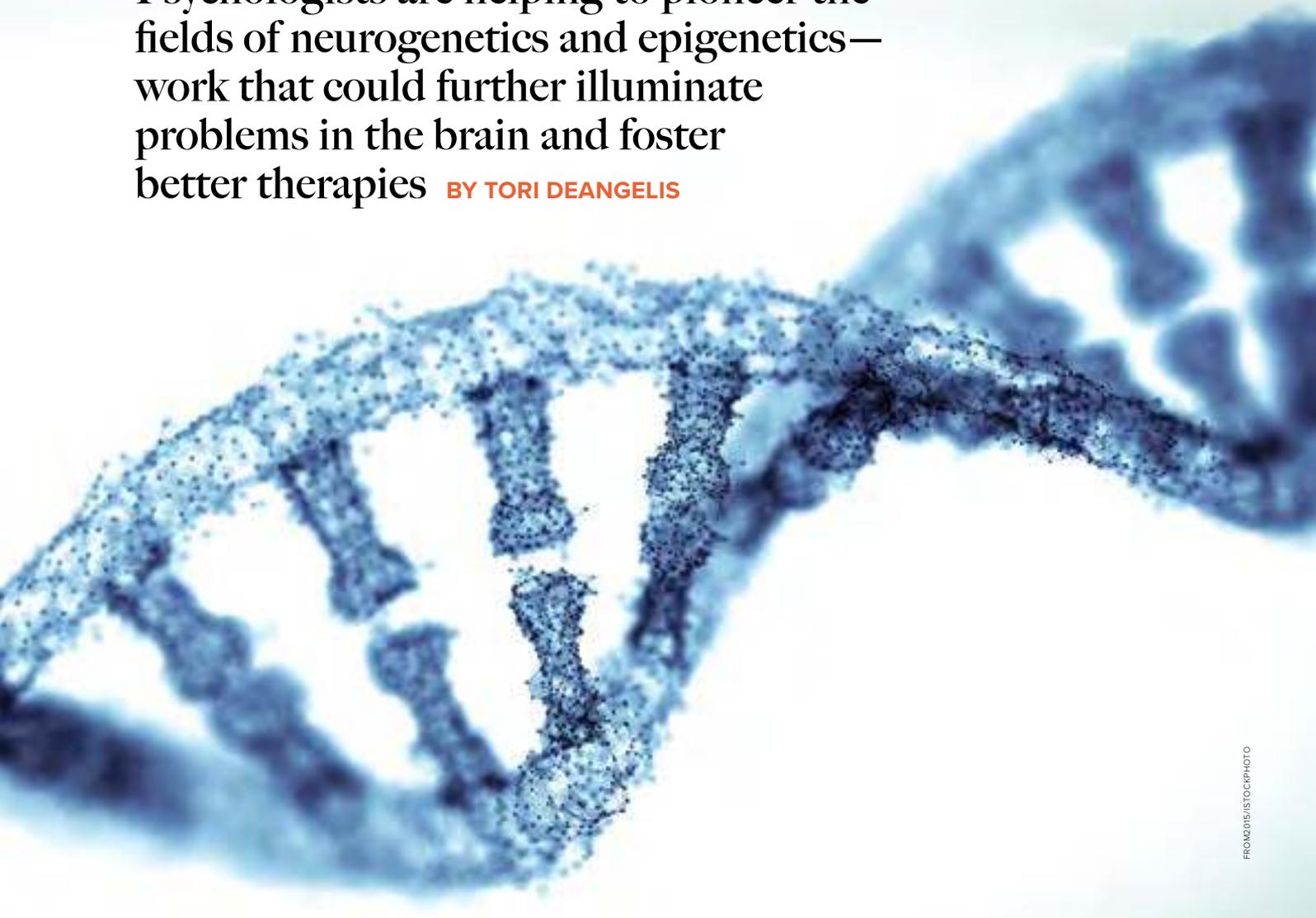
“As citizens, we all need to be engaged in our government, advocating for funding for education and health care, to solve social problems and all the other things we’re involved in [through our work],” Block says. “Who better than psychologists and other scientists to be involved in the political process?” ■

● To learn more about APA’s advocacy efforts, go to www.apa.org/about/gr/index.aspx.

5

EPIGENETICS OFFERS THE PROMISE OF MORE PRECISE TREATMENTS

Psychologists are helping to pioneer the fields of neurogenetics and epigenetics—work that could further illuminate problems in the brain and foster better therapies **BY TORI DEANGELIS**



IN AN EFFORT that could vastly improve treatments, psychologists are delving more deeply than ever before into the roles played by genes and gene expression in mental illness, substance abuse and neurodevelopmental disorders. These psychologists are intent on closing an important research loop. ¶ “Over the years, there has been a tremendous amount of work on the molecular side, a tremendous amount of work on the behavioral side, but relatively little precise work that connects the dots between the two, especially in the context of vulnerability,” says J. David Jentsch, PhD, professor of psychology at Binghamton University. ¶ This work is garnering major interest from the National Institutes of Health in

the form of its Roadmap Epigenomics Project, for example, a research consortium launched in 2007 to develop publicly available epigenome maps of many types of human cells. In addition, individual institutes, including the National Institute of Mental Health, the National Institute on Drug Abuse and the National Institute on Alcohol Abuse and Alcoholism, are providing generous funding in the area. In 2014 and 2016, NIDA awarded two five-year grants of \$12 million each to two groups of researchers to study the link between genes and behavior related to drug abuse. NIDA also pours millions of dollars into the Avenir awards, which fund early-stage investigators in the study of drug abuse genetics and epigenetics.

A FIT FOR PSYCHOLOGY

While neurogenetics and epigenetics are embedded within the larger study of

genetics, their foci make them particularly attractive areas for psychological study.

Neurogenetics addresses gene-related phenomena related to the brain and central nervous system. Epigenetics—which can encompass neurogenetics or any other form of genetic study—refers to the larger forces that shape gene expression, among them environmental and developmental influences.

At a molecular level, these influences may affect whether a gene is turned on (leading generally to the synthesis of a specific protein), how deeply a gene is located within a DNA coil or how much of an influential biochemical process called methylation is happening inside a DNA molecule, for example. While such processes do not change the gene per se—they are not gene mutations, in other words—they can affect gene expression and thus behavior.

While many players sit at the neurogenetics and epigenetics table—among them molecular biologists, genetic statisticians and developmental biologists, to name a few—psychologists offer unique assets. For one, they already know a lot about the brain’s workings and its effects on behavior. The study of epigenetics is particularly compelling for psychologists because it offers the opportunity to examine and control behavioral influences on genetic programming, says Jeremy Day, PhD, who studies the epigenetics and neurogenetics of cocaine addiction in his lab at the University of Alabama, Birmingham.

“We now know that a considerable fraction of your epigenome is modifiable by your experiences—that every major experience you have changes how genes are expressed in some of the cells in your brain,” he says.

In terms of addiction research, this means that the aspects of a person’s genetic expression that allow him or her to become addicted in the first place could themselves be targets for intervention. If those interventions are successful, they could lessen a person’s tendency toward addictive behavior.

That same thinking can be applied to other conditions as well, says Day. Depending on the gene and brain areas involved, such strategies could be used to help people remember important information or stay calm under pressure, for example.

“The thing that intrigues me, and many other people with a psychology back-

ground, is that these [epigenetic factors] can be modified”—not necessarily by changing the genetic code, but by changing how genes are turned off and on in different neurons, he says.

Psychologists also bring important perspectives from the field's various sub-disciplines. With funding from NIMH, for instance, Virginia Tech psychologist Sarah Clinton, PhD, is studying not only the genetic and epigenetic underpinnings of anxiety and depression in rats, but what those phenomena look like at different developmental stages. Understanding such patterns could help tailor treatments in very young children before these propensities become full-blown disorders.

“This idea of tailoring particular treatment strategies based on molecular biomarkers would ideally be the wave of the future,” she says.

MAJOR GROWTH AREA

New tools are now enabling this work to proceed with unprecedented accuracy, adds Clinton. Five years ago, if researchers wanted to measure DNA methylation, for instance, they had to remove and examine tissue from the brain area they were interested in—a gross measure of this chemical process. But with new technology, researchers can collect specific DNA samples from various animal sources—such as brain tissue, blood or saliva—view the DNA sequence and map out in fine detail the patterns of methylation within a single gene or even a particular gene segment.

Meanwhile, University of Minnesota assistant professor Nicola Grissom, PhD, is attempting to better understand the molecular, genetic and epigenetic phenomena that may fuel neurodevelopmental conditions such as autism and attention-deficit/hyperactivity disorder (ADHD). She's especially interested in examining such processes in the brain areas responsible for goal-directed behavior and executive function, iden-



Epigenetic factors can be modified by changing how genes are turned off and on in different neurons.

tified in previous research as areas that function differently in people with these conditions.

Grissom and other psychologists add a distinctly human touch to these fields as well. For example, Grissom is interested in testing whether nonpharmacological interventions such as tailored cognitive training can act epigenetically to improve quality of life for those with autism or ADHD. In other efforts, Jentsch, who studies additions and genetics at Binghamton, is intrigued by work suggesting

that targeted behavioral interventions—cognitive training or aerobic exercise, for instance—may enhance addicts' ability to exert self-control.

Starting gene-related inquiry with an eye to human behavior and consequences, rather than simply with cells and genes, gives this work added significance, Jentsch believes.

“The findings are more translational, and they can end up impacting on more diseases because we started with the right focus,” he says. ■

6

RESEARCH ZEROES IN ON THE COSTS OF UNHEALTHY WORKPLACES

Psychologists are documenting the financial losses companies suffer when they fail to provide workplaces that offer psychosocial safety **BY AMY NOVOTNEY**



IT SOUNDS INTUITIVE: Give employees reasonable workloads, control over their jobs and support when they need it and the companies they work for will thrive. But proving that concept—particularly showing the economic cost of disregarding such factors—has been elusive. Now, psychologists are bringing a much-needed economic focus to occupational health by conducting research on the concept of “psychosocial safety climate” and documenting the financial cost of ignoring workers’ emotional well-being. That is what’s needed to get employers’ attention and to foster workplace change, psychologists in the area say. “If you can save money and/or save lives, everyone is going to be interested in those outcomes,”

says psychologist Mo Wang, PhD, a professor in the Warrington College of Business at the University of Florida.

Australian psychologists and the Australian government are leaders in this expanding realm of research. A 2016 report by Safe Work Australia, a government agency that develops and evaluates workplace safety laws, found that employers who prioritize productivity over employee well-being lose on average \$6 billion a year—about \$4.5 billion in U.S. dollars—due to higher levels of employee absences, as well as lower levels of employee engagement and commitment.

The report, based on interviews with more than 4,200 employees from a variety of industries, looked specifically at psychosocial safety climate, a measure of how much an organization values psychological health, says Maureen Dollard,

PhD, one of the report’s authors and a professor of work and organizational psychology at the University of South Australia’s Asia Pacific Centre for Work Health and Safety. “It’s fundamental to capitalism that there is a constant focus on growth and productivity, but there has to be some limit because humans have a finite capacity for how much they can produce in a day,” Dollard explains. “Psychosocial safety climate looks at the balance of worker psychological health versus productivity, and the priority that management has for worker psychological health.”

Workplaces that rate high in psychosocial safety have managers who are committed to prioritizing the well-being of their workers, including their emotional health. In addition, they design worker roles that are not overly demanding and that provide the opportunity for

autonomy and social support.

Organizations low in prioritizing psychosocial safety often design roles with high demands and low control. Research by Dollard and her colleagues has shown that workers in such environments are significantly more likely to call in sick or be present but not productive than those in environments high in psychosocial safety. According to the report, workers in the less psychologically healthy environments took 43 percent more sick days per month and were significantly less productive when at work, equating to \$1,887 per employee per year—which converts to about \$1,400 in the United States—in cost to employers, she says.

In a separate study, Dollard and colleagues also found links to increased work injuries among health-care workers operating in low-psychosocial-climate work groups (*Stress and Health*, online January 2017). Much of the increase can likely be attributed to the increase in emotional exhaustion among workers in the less psychologically healthy teams.

“We’ve been trying to use this economic argument to show organizations that if they really are interested in productivity, they are going about it the wrong way because if you don’t care for your workers, they will burn out,” she says.

To increase psychological safety and improve employee mental health, employers can design jobs that give employees more control over their work and encourage senior management to establish manageable demands and

Workers in less psychologically healthy environments took 43 percent more sick days per month than workers in healthier settings.



working hours, the research suggests. Also key is promoting communication from managers that reminds workers of employee-assistance programs and other services they can tap for help, as well as having senior managers who support those who do experience mental health problems, she says.

While most of the world lags behind Australia when it comes to establishing a national effort to improve worker psychological health, other researchers are catching up. In the United States, organizational psychologists are expanding their studies on how work stress affects other aspects of a worker's life, including eating behaviors, sleep quality and aggression. In a study published

online in April in the *Journal of Applied Psychology* (2017), Wang and his team examined how work-related stressors affect employee eating habits in China. They surveyed 125 IT workers daily for three weeks about their job demands and food consumption and found that when employees experienced more job demands in the morning, they ate less healthfully at night.

Greater dissemination of such research is needed to help organizations take notice, says James Grosch, PhD, a senior research psychologist with the National Institute for Occupational Safety and Health. "We have a pretty good understanding of these issues, but now we really need to transfer this knowledge and the informa-

tion published in these research journals out to organizations so that they better understand the best practices in this area," Grosch says.

Some of this is already happening, he notes, through such programs as the APA Center for Organizational Excellence's Psychologically Healthy Workplace Awards and Organizational Excellence Award, which all honor employers that have implemented workplace practices that foster employee well-being and enhance organizational performance.

"We really need to provide more of this hands-on, practical advice to people," Grosch says. "That's the ultimate goal of a lot of the work we do." ■

7 INTEGRATED HEALTH TRAINING IS ON THE RISE

Expanded interprofessional education and training is boosting psychologists' skills and highlighting the critical role they can play on care teams **BY TORI DEANGELIS**

CECILE_ARCURS/ISTOCKPHOTO



INTERPROFESSIONAL EDUCATION—learning alongside health-care professionals from other disciplines as a way to improve patient-centered care—is fast becoming an accreditation requirement for many health-care professions. In fact, by 2014, 92 percent of medical schools required their students to receive such education. ¶ Psychology has been slower than other disciplines to get on board with such training, largely because it’s such a diverse field. Now, that’s changing. Universities are beginning to offer interprofessional education to students, while training opportunities for practitioners are opening up nationwide, including a federally funded program that offers training for thousands of psychology practitioners.

And APA’s latest accreditation standards require that doctoral students be exposed to interdisciplinary and interprofessional interaction during their academic program.

“There is no question that psychology is now at the table” as a player in interprofessional health care and education, says Barbara Brandt, PhD, director of the National Center for Interprofessional Practice and Education (NCIPE) at the University of Minnesota, which provides interprofessional training and resources for all health-care disciplines. “I’ve seen some amazing implementations across the United States with psychology involved.”

STARTING WITH STUDENTS

At Tennessee State University, psychology and other health-care students are taking part in a program where they’re learning together from the get-go.

Students in 10 health-care disciplines, including psychology, receive an intensive four-day educational immersion during their first year, and over time become immersed in hands-on interprofessional experiences at practica, internships and other sites. In addition, the university’s department of family medicine was awarded a \$1.7 million grant from the Health Resources and Services Administration (HRSA) to create and educate students and faculty in innovative models of team-based care.

Intimately involved in this work is psychologist Jodi Polaha, PhD, who educates students and faculty in all health disciplines on effective collaborative care.

The work is making a big difference in the lives of the low-income rural patients served at the university’s clinic because providers are better able to ascertain and address patient needs, Polaha says. “In

my experience, the more similar our language is around our shared goals for our patients and our shared vision around what team-based care should look like, the better.”

Counseling psychology doctoral students at New Mexico State University (NMSU) have been learning together with students in nursing, social work, pharmacy and family medicine since 2004, thanks to funding from HRSA’s Graduate Psychology Education Program. The NMSU program features interprofessional team-building, and academic and clinical experiences that prepare students to work in rural and other settings where access to mental health care is often provided through primary care clinics.

Such education and training means students are highly prepared to work on integrated teams when they head off to internships and jobs, says NMSU counseling psychology professor and training director Eve Adams, PhD. “Many of our students end up with jobs in the Veterans Administration, health-care centers, prisons with integrated-care programs, and other sites that enable them to continue this work.”

In an effort to guide interprofessional education, last year APA also released a free online curriculum for a seminar in integrated care for all health professional students, including psychology students. The curriculum consists of eight modules, which instructors can use together or individually, covering such topics as the rationale for integrated care, popula-

tion health approaches, team leadership and working with other disciplines.

CONTINUING EDUCATION

Interprofessional training opportunities for practicing psychologists are burgeoning as well. In 2016, APA received a \$2 million award from the Centers for Medicare and Medicaid Innovation that will be used to train 6,000 practicing psychologists in interprofessional care delivery. It's part of a larger Centers for Medicare and Medicaid Services program called the Transforming Clinical Practice Initiative, which will help

140,000 clinical practices nationwide share, adapt and further develop comprehensive strategies to improve care and reduce costs.

Interprofessional training for practicing psychologists is springing up in other venues as well:

- Each June, the University of Rochester offers a five-day intensive training on integrated care and working with families.
- Cherokee Health Systems, a federally qualified health-care center in Knoxville, Tennessee, provides two-day training academies in integrated care.

■ The University of Michigan School of Social Work offers web-based courses in integrated behavioral health and primary care, including pediatric, adult and combined pediatric/adult tracks.

■ NCIPE hosts an annual conference and other training for providers who want to gain better interprofessional skills.

■ The Interprofessional Education Collaborative, a network of professional education associations that has developed interprofessional competencies and other guidance for universities, professional schools and employers of health care providers, offers regular faculty development institutes in interprofessional education and collaborative care.

■ APA and the American Diabetes Association offer a two-day training on the behavioral management of diabetes.

As psychologists grow more established in integrated care, a vital part of their work must include effectively communicating their expertise to key stakeholders in hospitals and other health-care settings, area leaders emphasize. Contrary to public perception, providing direct clinical services in these settings is not the only task that psychologists are hired or want to be hired for: They also may supervise master's-level clinicians who do the frontline work, train interns, develop and evaluate programs, consult on complex cases and facilitate team functioning, to name just a few roles.

"The more we can highlight our value, the more leadership will want that skill set in their institutions," says Wendy Ward, PhD, who co-directs a 30-hour mandated interprofessional care education program at the University of Arkansas for Medical Sciences.

In fact, psychologists bring a perspective that is precisely in the direction that health care is moving toward: looking at the whole person in his or her family and cultural context rather than as a patient with an illness. ■



Expanded training and education in integrated care is enabling students to immediately work on health-care teams in internships and new jobs.

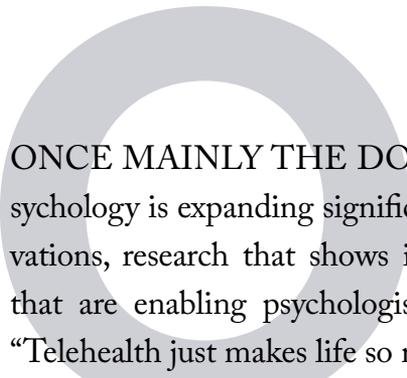
8

TECHNOLOGY IS REVOLUTIONIZING PRACTICE

Apps and virtual help agents are forever changing the way psychological services are delivered **BY AMY NOVOTNEY**

PORTRA/ISTOCKPHOTO





ONCE MAINLY THE DOMAIN of rural practitioners, telepsychology is expanding significantly, thanks to technological innovations, research that shows its effectiveness and policy changes that are enabling psychologists to practice across state lines. ¶ “Telehealth just makes life so much easier,” says psychologist Mary Alvord, PhD, who uses HIPAA-secure video conferencing technology to see clients, conduct staff meetings and trainings, and supervise trainees as part of her practice in the Washington, D.C. suburbs. “It helps us overcome so much in terms of treatment barriers,” which include stigma, access to specialists and commute times in urban areas, where “it can take 45 minutes to go just a few miles for an appointment,” she says.

Now, new forms of telehealth are taking therapy beyond video conferencing. Among the latest creations is Woebot, the world’s first chatbot designed to help improve mental health. Created by a team of former Stanford University psychologists and artificial intelligence experts, Woebot uses Facebook Messenger to deliver a form of cognitive behavioral therapy, asking users how they’re feeling and what is going on in their lives through brief daily conversations. The bot also sends videos and mental health advice, depending on a user’s mood and needs at the time.

Research shows it works. A peer-reviewed randomized controlled trial with a group of college students found that Woebot decreased symptoms of depression and anxiety after just two weeks (*JMIR Mental Health*, Vol. 4, No. 2, 2017).

While Woebot is certainly not intended to replace traditional psychological care, the hope is that this technology may provide a more accessible option, particularly for those with less severe mental health issues, says psychologist Alison Darcy, PhD, CEO and founder of Woebot Labs Inc. “Barriers, like cost of treatment and social stigmas, have prevented people from getting the help that they need,” Darcy says. “Woebot represents a new era in digital health.”

In a similar vein, psychologists are exploring the use of “Just-in-Time Adaptive Interventions,” or JITAIs, delivered via smartphone. JITAIs seek to give people the support they need at the time they need it, such as smokers who are more likely to crave a cigarette when they are stressed or see someone else smoking.

“When it comes to unhealthy behaviors, you’re more at risk of engaging in them at certain times,” says psychologist Bonnie Spring, PhD, who directs the Center for Behavior and Health in the Institute for Public Health and Medicine at Northwestern University. “But in the classic model, where you see your therapist once a week, the therapist isn’t there in the moment when you need help to overcome the temptation.”

Spring and her team are equipping smokers with sensors that pick up users’ heart rates and respiration patterns, and determine when they are stressed and when they are smoking. The team studies participants for several days while they are still smoking, then coaches them to quit by helping them cope with the stress of nicotine withdrawal. When a participant’s sensor detects that they are stressed, for example, a relaxation app automatically opens on their smartphones. The idea is to prompt them to calm down by doing a relaxation exercise rather than reaching for a cigarette.

The goal of these technologies is to intervene in rapidly changing conditions that occur outside standard treatment settings while minimizing disruptions to a person’s daily life and routines. “It’s important to keep in mind that we can’t just provide reminders every time a person experiences stress because people can get habituated to repeated reminders, or get irritated or feel overwhelmed if reminders are provided too frequently or at inconvenient times,” says Inbal (Billie) Nahum-Shani, PhD, a Univer-

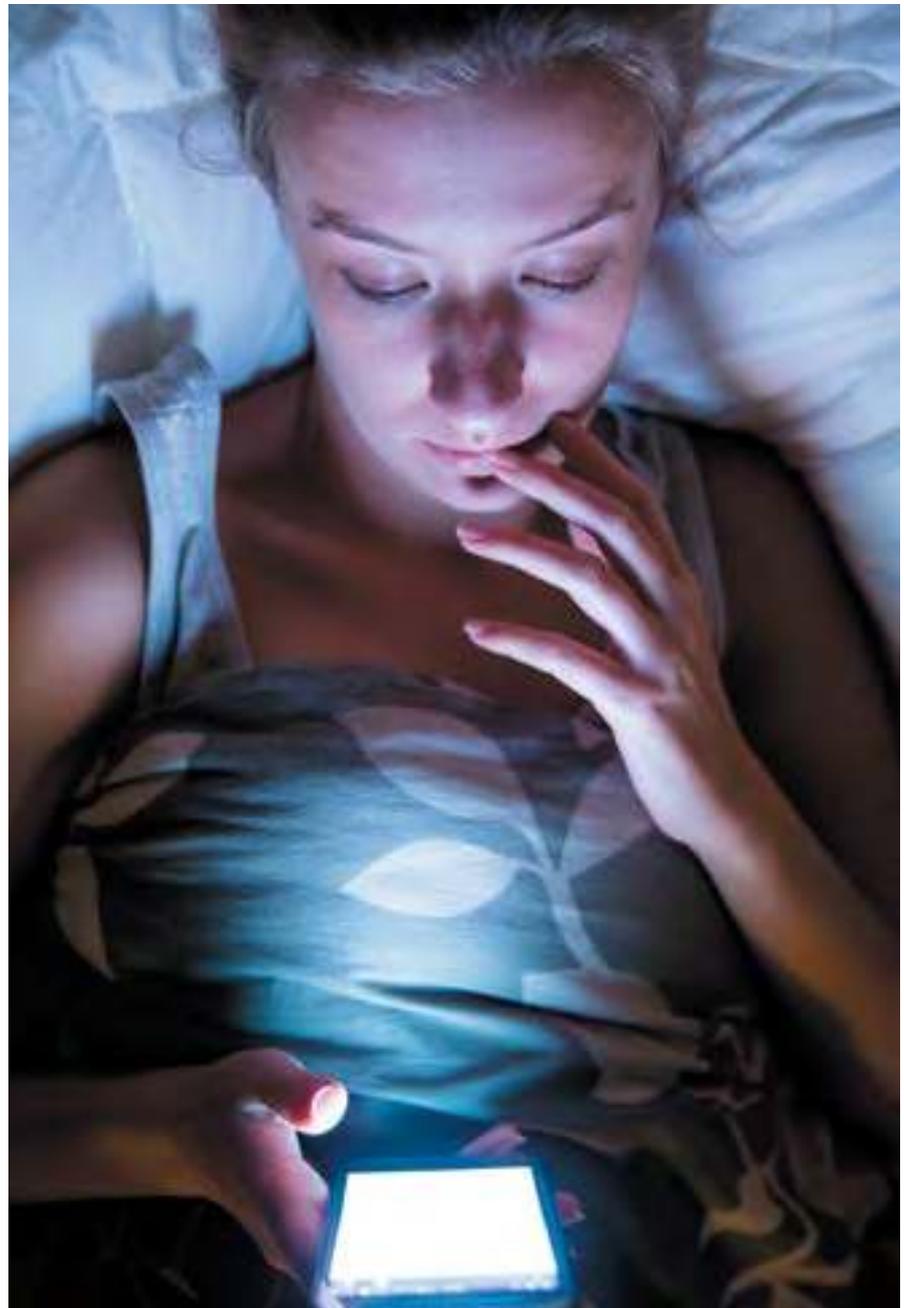
sity of Michigan behavioral sciences professor who is also studying JITAIs. That's why JITAIs are designed to offer an intervention only when the person is receptive. "To effectively provide just-in-time interventions, we need to be able to assess not only when the person requires support, but also when the person can actually benefit from it."

Meanwhile, research continues to document the promise of technology in psychology practice. A review of more than 100 controlled trials published last year concluded that therapist-guided internet treatments are effective for a wide range of psychological conditions (*Annual Review of Clinical Psychology*, Vol. 12, 2016). Evidence is particularly strong around the effectiveness of treating anxiety, stress and depression online (*Journal of Technology in Human Services*, Vol. 26, Issue 2–4, 2008). And new services such as BetterHelp, Therapy Live, LARKR, 7 Cups and others tout on-demand talk, text or video therapy to provide consumers with greater flexibility (see "A Growing Wave of Online Therapy," February 2017 *Monitor*).

And in more good news for telepsychology practice, 31 states plus Washington, D.C., now have parity laws requiring insurers to cover telehealth services if they cover in-person care (although Medicare still reimburses for telehealth only outside metropolitan areas or in "health professional shortage areas").

Progress is also continuing on enacting the Psychology Interjurisdictional Compact (PSYPACT), which allows licensed psychologists to offer telepsychology services in participating states without having to get licensed in those additional states, says Alex Siegel, JD, PhD, director of professional affairs at the Association of State and Provincial Psychology Boards, the organization that developed PSYPACT.

Three states have enacted PSYPACT



legislation and several more have introduced legislation to adopt it, but PSYPACT will only become operational once it is enacted in seven states.

Siegel says he expects that will happen in 2018. "It's no longer a question as to if PSYPACT will happen—just when." ■

A review of more than 100 controlled trials published last year concluded that therapist-guided Internet treatments are effective for a wide range of psychological conditions.

9

EQUALITY FOR WOMEN PSYCHOLOGISTS TAKE ON NEW URGENCY

Women outnumber men in the psychology workforce, yet still aren't equally represented in the field's top positions or paid as much as men **BY HEATHER STRINGER**

PEOPLEIMAGES/ISTOCKPHOTO



TWENTY YEARS AGO, an APA report found that the number of women in psychology outstripped that of men, though their salaries and status still trailed behind. Fast-forward to 2017, and a new APA report reaches the same conclusion. “The Changing Gender Composition of Psychology: Update and Expansion of the 1995 Task Force Report” reveals that women in psychology continue to lag behind men in power, status and salary. ¶ “It’s a reminder to everyone that we’re still working on this issue and certain inequalities need to be changed,” says Ruth Fassinger, PhD, professor emerita at the University of Maryland’s College of Education and a leading contributor to the APA study, which was authored by the association’s Committee on Women in Psychology.

Perhaps even more surprising is that a lack of equity continues for women in psychology even as women in other scientific fields see more significant gains. Women with computer science and math doctoral degrees, for example, earn about 84 percent of their male counterparts’ wages. For those with doctoral psychology degrees, the percentage is 77 percent—which is actually 8 percent lower than in 1993.

“The fact that we are not doing as well as some other fields is a bit alarming,” says Fassinger. “You would expect psychology to be the leader of the pack because we have people with expertise in areas relevant to this problem,” such as those who specialize in organizational change, gender issues and career development. Perhaps even more important, psychology is a discipline that espouses

the value of human dignity, equality and creating healthy, socially just environments, Fassinger says.

Addressing these inequalities needs to be a national priority because “economic security of women is not just about women—it’s about the prosperity of children, families, communities and the national economy,” according to a 2017 report by the Closing the Women’s Wealth Gap (CWWG) initiative, which is working to understand the causes and effects of the gap and to identify solutions.

Women today have a greater role in providing financial security because they are much more likely to be breadwinners than in the past. In 2015, 42 percent of mothers were sole or primary breadwinners, and another 22 percent were co-breadwinners, finds the Center

for American Progress. That means 64 percent of mothers had a breadwinning role in 2015 compared with less than 10 percent in 1967.

As a result, women should have an increasingly critical role in providing financial assets families can use for emergencies, investments or to pass on to future generations—yet women are still facing significant barriers that prevent them from accumulating wealth, the CWWG report says. Those barriers range from private sector practices to public systems to policy barriers.

In the academic arena, for example, data in the APA report reveal that far fewer women in psychology achieve full professorship than men. Even though more women are getting jobs in four-year academic institutions (the number of women increased by 250 while the number of men decreased by 1,800 between 1995 and 2014), they are much more likely than men to be at the assistant professor level. In the 2013–14 academic year, 46 percent of men were full professors compared with only 28 percent of women.

Another surprising inequity: Even though 58 percent of APA’s members are women, only about 30 percent of APA fellows are, the report found. Fellow status is given to APA members who have shown evidence of unusual and outstanding contributions or performance in the field of psychology.

APA leaders emphasize that it’s important for the field to better understand the barriers that keep women from higher prestige and income.

“If we research how women are making training and career decisions, we might be able to design solutions to the problems they encounter,” says Fassinger.

For example, she says, perhaps training programs could be restructured to be more conducive to women who have family responsibilities.

“What if we mapped internship site development to graduate training programs in a given geographic area so students could avoid moving their families across the country to fulfill this requirement?”

APA's Committee on Women in Psychology also recommends that the association form task forces to address the wage gap and underrepresentation of women in academic leadership and full professor positions. APA could also advocate for federal and state policy that encourages salary transparency.

Another solution APA has been promoting is leadership training for women. As part of that effort, in 2008 APA established its Leadership Institute for Women in Psychology, which has trained more than 300 women in such topics as mentoring, fiscal management and the role of political advocacy. The training is offered once a year for five days to about 40 participants.

“Our hope is that women psychologists will become leaders in all sectors of society so they are in decision-making roles when policies are being made,” says Shari Miles-Cohen, PhD, senior director of the Women's Programs Office. “They generally recognize that there is a gender gap, and will be more likely to question previously accepted views, such as what makes a good leader.”

Psychologists are also doing more to promote women as editors of the field's journals. According to the report, just 18 percent of APA journal editors are women, a number that has increased by only 4 percent in 20 years. To increase those numbers, the Women's Programs



Women in psychology continue to experience inequality even as women in other scientific fields make gains.

Office and Committee on Women in Psychology host a roundtable at the annual convention where journal editors who are women discuss topics such as what's involved in being an editor, how to become one and balancing the role with other work and family responsibilities.

Another journal editor who is working to draw more women to these roles is Jennifer Wisdom, PhD, MPH, of the Graduate School of Public Health and Health Policy at the City University of New York. Wisdom, who is the new co-editor of the *Psychologist-Manager Journal*, and her co-editor, George B. Yancey, PhD, are planning to launch a mentoring program to help students learn how to submit and review manuscripts.

“I hope to increase the pipeline of women who are reviewing and eventually editing manuscripts,” Wisdom says. She also leads a seminar at her school to support faculty and students—and particularly women—who are interested in learning how to lead studies in the field of mental health.

“It's important for women to choose to see everything as a leadership opportunity, even if they start in a helper or contributor role,” Wisdom says. “If you don't see yourself as a leader, then it will be hard for others to see you that way.” ■

● **To learn more** about APA's Leadership Institute for Women in Psychology, visit www.apa.org/pi/women/programs/leadership. To nominate an editor for an APA journal, go to www.apa.org/pubs/authors/call-for-nominations.aspx.

10 PSYCHOLOGISTS EMBRACE OPEN SCIENCE

The field is working to change cultural norms to encourage more data sharing and open science

BY LEA WINERMAN

VLAD TCHONPALOV



FOR MUCH OF THE LAST DECADE, psychologists have been debating whether the field faces a replication crisis. In 2015, a widely publicized attempt to replicate 100 studies from three top social and cognitive psychology journals was able to reproduce the results of less than 40 percent of them (*Science*, Vol. 349, No. 6251). Other replication studies have cast doubt on once-established ideas, including ego depletion and behavioral priming. ¶ These papers have sparked controversy over their methods and over whether large-scale replication studies are a worthwhile use of time and resources. But while the debate continues over how much of the research canon will hold up to scrutiny, the psychologists

spearheading the reproducibility movement want to focus on a forward-looking task as well—changing the way psychological research is done to encourage more researchers to share data and research methods, and to replicate research as a matter of course, rather than as a one-off project.

“This year, we’ve been focused on developing technologies to support more open and reproducible research and on changing the culture of incentives so that it’s in researchers’ best interest to be open and reproducible,” says Brian Nosek, PhD, a psychology professor at the University of Virginia and executive director of the Center for Open Science in Charlottesville, Virginia.

The center is not concerned with psychology alone—it aims to encourage open science in all fields, many of which face similar reproducibility questions.

In January, for instance, the center released the first results from a cancer biology replication project, finding that researchers were only able to “substantially replicate” the results of two of five pre-clinical cancer biology studies they sought to reproduce.

Indeed, across scientific fields, researchers are being urged to share their data, methods, computer code and other research products. The aim is not only to address replication questions, but also to help other scientists gain a fuller understanding of published studies and encourage research progress more broadly.

A 2013 memo from the White House Office of Science and Technology Policy directed federal research agencies to develop plans to make the published research results of their funding freely available to the public within 12 months of publication, and to better account for

and manage data. NIH, for example, requires its grantees to make available all published research papers in its PubMed database.

Now, the agency is also encouraging its grantees to make results publicly available more quickly through pre-prints—defined as research papers that have not yet gone through the peer review process—saying that applicants can cite preprints in new grant proposals.

Still, the data underlying most published research—in psychology and other fields—are not shared with the public or other researchers, and many structural and cultural barriers remain. In July, the National Academy of Sciences convened a “Toward an Open Science Enterprise” task force to examine those barriers and make policy recommendations for federal science funding agencies.

The Center for Open Science’s growth reflects this mounting interest in its work. Over the past four years, it has expanded from a two-person operation to encompass 60 staff and an \$8 million operating budget. Its signature product is the Open Science Framework (OSF), software used by 50,000 scientists that allows them to upload—and share as they choose—their research methods, data and analyses. APA is now creating an OSF-hosted repository to store and archive data, protocols and materials from studies published in APA journals.

The center is also championing several initiatives to reward scientists who use open and reproducible research practices. APA’s Office of Publications and

Databases, for example, recently signed onto its “badge” system that journals can use to identify studies that include open data or materials. Studies can also earn a badge for having a preregistered design, which includes a plan for analyzing data before they are collected (reducing the possibility that researchers will make inappropriate choices in analysis to achieve statistically significant results).

While the badge system might seem like a small incentive, a 2016 study found that it was effective: When *Psychological Science* introduced badges, it increased the rate of open-data studies it published from 3 percent to 39 percent in one year (*PLOS Biology*, Vol. 14, No. 5).

The center is also running a “preregistration challenge” to award researchers \$1,000 for publishing their first preregistered study, and has developed guidelines for journals, publishers and researchers

interested in implementing their ideas.

“The biggest challenge is that people want to change their research practices, but open science practices are harder and slower, and researchers worry about whether systems will reward these harder and slower practices,” says Simine Vazire, PhD, an associate professor at the University of California, Davis. For example, preregistering a study means that researchers must decide on all research and analysis methods, and write them up in detail, before beginning the study. Sharing data might involve learning to use new software that allows it. “We want to make sure that the incentives line up,” Vazire says.

Of course, all of this work is not without its challenges and critics. Some psychologists believe, for example, that preregistering studies can impede the creativity and freedom that researchers

need to make scientific progress by not allowing researchers the flexibility to adjust their analysis methods and ask new research questions over the course of a study. But advocates explain that researchers can still conduct exploratory analyses, as long as they make clear which analyses are exploratory and which are testing previously formulated hypotheses.

And, critics say, journals that encourage data sharing must do so with the knowledge that, for privacy and other reasons, not all data can be open—and the journals must not penalize researchers who work with such data.

“My goal is to have a vigorous open discussion of these pros and cons, and find some middle ground,” Vazire says. “Our critics can help us find where our proposed changes have unintended consequences and improve them.” ■



APA is now creating an OSF-hosted repository to store and archive data, protocols and materials from studies published in APA journals.

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