AMPPS Makes Its Entrance

Observer

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MARCH METHODOLOGY MADNESS

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NEW APS JOURNAL

Advances in Methods and Practices in Psychological Science

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FEATURED SPEAKERS

Fred Kavli Keynote Address

LYNN NADEL

The University of Arizona

Making and Remaking Memory: Past, Present, and Future

Lynn Nadel's scientific exploration of the hippocampus has led to groundbreaking developments in understanding how space and memory are represented in the brain. He coauthored the seminal book *The Hippocampus as a Cognitive Map* with John O'Keefe, and shared with him the 2006 Grawemeyer Award.

Presidential Symposium

Memory: From Neurons to Nations

APS President Suparna Rajaram brings together four distinguished psychological scientists to speak about the nature of memory from a variety of perspectives that include cognitive, neuroscientific, cultural, and developmental approaches for this year's Presidential Symposium.

SUPARNA RAJARAM (Chair)
Stony Brook University, The State University of New York

DORTHE BERNTSEN
Aarhus University, Denmark

HENRY L. ROEDIGER, III
Washington University in St. Louis

CHARAN RANGANATH
University of California, Davis

QI WANG
Cornell University

Bring the Family Address

The Paradox of Diversity: Promise, Pitfalls, and Implications for Racial Progress

JENNIFER RICHESON

Yale University

Jennifer Richeson has received numerous honors and awards for her research focusing on the social psychological phenomena of cultural diversity and social group membership. A Guggenheim Fellow and a MacArther Fellow, Richeson has used a broad range of empirical methods to examine the potential cognitive "costs" and mutual misperceptions associated with intergroup interactions.

Observer

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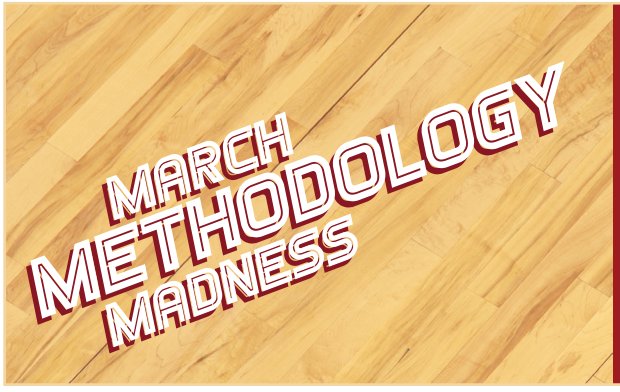

In our annual nod to the United States' college basketball tournament, the *Observer* reports on cutting-edge data-analysis techniques, insights on methodological advances, and the latest initiatives for improving reproducibility in psychological science.

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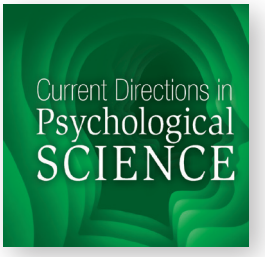

"Variations in Face Recognition Ability: Stable, Specific, and Substantial" by **Gil Einstein** and **Cindi May**

On Collaborations: The Opportunities

We now work in an era where research questions increasingly span many different boundaries … In other words, collaborations make it possible to ask questions that might be difficult, if not impossible, to ask alone.

Photo credit: Jeanne Neville

Suparna Rajaram
APS President

No matter what accomplishments you make, somebody helped you.
-Althea Gibson, 11-time Grand Slam Champion

In sports, collaborations are indispensable. As the great Michael Jordan once said, "Talent wins games, but teamwork and intelligence win championships." In music, too, as Lin-Manuel Miranda of unprecedented "Hamilton" fame said, "The fun for me in collaboration is … working with other people just makes you smarter; that's proven." In business, the need for collaboration seems obvious.

That brings me to the practice of science, and my conversations in these columns with early investigators in particular. There is an important tension when collaborating in teams to leverage greater resources — intellectual and material on the one hand, and establishing one's individual identity and contributions on the other. How do you navigate these competing goals across the span of your career, especially if you are just starting out?

Perhaps a brief history of my own path is useful to set the context for why I find this question fascinating. I have published single-author papers (especially during my assistant professorship), and I have also published papers in collaboration — with neurologists, neuropsychologists, cognitive neuroscientists, social psychologists, clinical psychologists, clinical neuroscientists, computational modelers, cross-cultural psychologists, and of course, other cognitive psychologists. I have also thought about collaborations through another lens — as a past academic administrator (I was Associate Dean for Faculty Affairs) and as a member of tenure and promotion committees both within my department and in the College beyond. In these positions, I have reviewed tenure and promotion dossiers to assess the independent, original contributions of individual scholars. So, what counts?

The answer to this question requires that we consider at least two points. When is a good time to collaborate? And what are the challenges associated with collaborative ventures? Here, I address the first question.

Before we ask the question about when to collaborate, it is worthwhile to start at the very beginning. We learn to collaborate early even as we train to become independent scientists. We learn from, collaborate with, and publish with our advisors. This foundational training gives us the two key tools we need — skills for collaboration as well as independent expertise — to enter into future collaborations as unique contributors.

We now work in an era where research questions increasingly span many different boundaries — from basic to applied, across labs, disciplines and nations, using multiple tools, techniques, and technologies. In other words, collaborations make it possible to ask questions that might be difficult, if not impossible, to ask alone.

Take some examples covered in the past issues of the *Observer* that describe emerging fields of collaboration in psychological science. Cross-cultural research spanning geographic borders deepens and enriches not only the questions but also the methodology. Research that integrates expertise from behavioral science, computer systems engineering, and game theory is exploring ways to use the study of psychological deception in preventing cyber attacks. Research leveraging behavioral science can bring about policy changes. Combining child development, neuroscience, linguistics, and robotics has given rise to the new field of developmental robotics. Incorporating psychology, immunology, epidemiology, genetics, and nutrition is helping scientists understand the effects of psychological stress on health and aging through the senescence of telomeres. Several fields are collaborating in the use of expensive tools such as neuroimaging. And, going a bit farther back in time, the broad field of cognitive science has brought together disciplines such as cognition, linguistics, philosophy, computer science, and neuroscience.

These are just a few examples. Furthermore, not all collaborations need involve large-scale efforts. In fact, collaborations are common in dyadic arrangements or small groups where researchers pursue shared questions. But these examples make my point. In brief, it is useful to ask whether collaborations would advance independent, original lines of investigation; help us test new integrative questions emerging from our work; or create access to resources that benefit several disciplines or investigators.

Under such circumstances, when researchers find common ground and questions, collaborations can transform our work.

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Anne Treisman, 1935–2018

APS Past Secretary **Anne Treisman**, considered one of the world's most influential cognitive psychologists, died February 10, 2018.

An APS William James Fellow, Treisman developed a classic psychological model of human visual attention. Her pioneering research led President Barack Obama to award her the National Medal of Science in 2013.

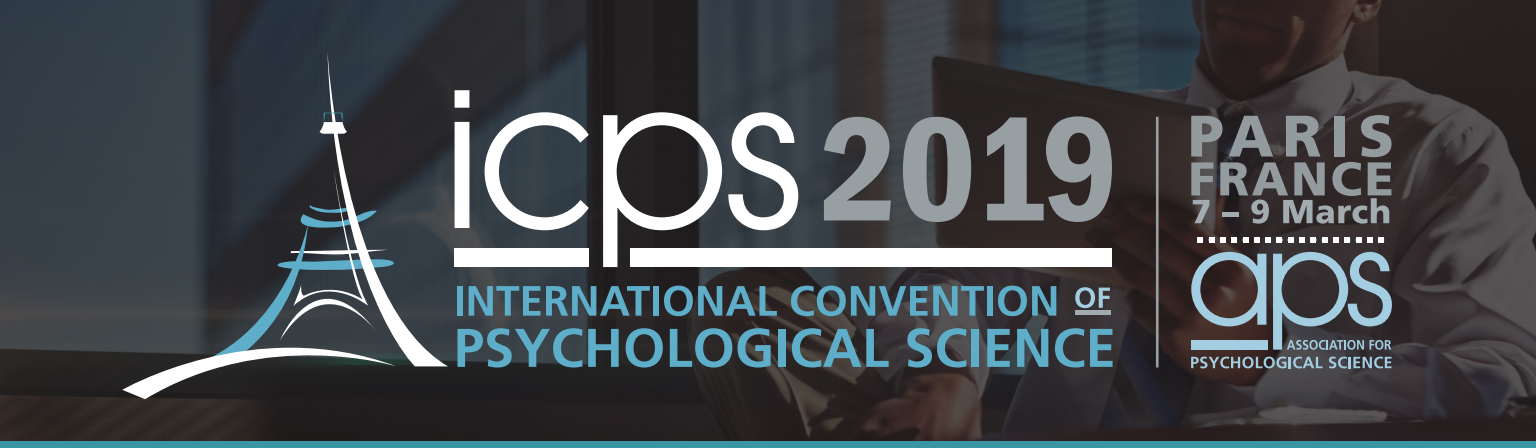
Treisman's research focuses on how humans perceive the world around them and turn those perceptions into meaningful thoughts, memories, and actions. One of her most noteworthy achievements is the Feature Integration Theory (FIT), which has been enormously influential in psychological science and related disciplines.

According to FIT, human visual perception allows us to encode characteristics such as color, form, and orientation even in the absence of spatial attention. Attention is what allows us to relate these features in a meaningful way and recognize objects.

In the absence of spatial attention, Treisman has demonstrated, the features that people perceive can bind randomly and cause perceptional errors. For example, people who are shown an image of a blue triangle and a red circle might report seeing a blue circle and a red triangle if they are not focusing their attention on the shapes and their colors.

Treisman's work has formed the basis for thousands of experiments in vision, cognitive, and neurological sciences. Her papers have been cited more than 8,200 times. FIT has sparked neuroscientific discoveries about the functions of pathways involved in representing locations and actions. Additionally, applied psychological scientists have relied on her work to help improve operations ranging from traffic signal design to airport baggage inspection.

A professor in Princeton University's Department of Psychology, Treisman held appointments at Oxford University, the University of British Columbia, and the University of California, Berkeley. She was elected to the Royal Society of London in 1989, the US National Academy of Sciences in 1994, and the American Academy of Arts and Sciences in 1995. In 2009, she received the University of Louisville Grawemeyer Award in Psychology for her explanation of how our brains build meaningful images from what we see. Look for a remembrance of Treisman in an upcoming issue of the *Observer*.



THE ASSOCIATION FOR PSYCHOLOGICAL SCIENCE IS PROUD TO ANNOUNCE

ICPS 2019 CALL FOR SUBMISSIONS OPENS MARCH 2018

The 2019 International Convention of Psychological Science (ICPS) offers opportunities to submit symposium and poster presentations. ICPS is the culmination of efforts by APS and an international network of organizations and individual scientists to stimulate scientific advances that are integrative; that is, in which investigators attack scientific problems by drawing broadly on research conducted at multiple levels of analysis and in multiple branches of psychological science, the cognitive sciences, the neurosciences, and other related disciplines. The initiative has been designed, in essence, to surmount artificial disciplinary boundaries that can impede scientific progress and to highlight areas of investigation in which those boundaries have already been overcome.

SUBMISSION DEADLINES

Symposium Submission Deadline

15 September 2018

Review of Notifications

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November 2018

Posters:

Rolling

Poster Submission Deadline

30 September 2018

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15 June 2018

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For eligibility and submission requirements, please visit:

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2018 APS Mentor Awards

The APS Mentor Award recognizes psychology researchers and educators who have made an extraordinary effort to shape the future of the discipline by influencing the career paths of the next generation of scientists. Three psychological scientists have been selected to receive the 2018 APS Mentor Award. Beyond their personal contributions to our understanding of memory, emotion, and learning, these educators' unique commitments to their students will continue to shape the field of psychological science for decades to come.

Gordon Bower

Stanford University

During a seminar at Stanford University, APS Past President Gordon Bower "began asking extraordinarily insightful and blunt questions," recalls APS Fellow Stephen M. Kosslyn, Founding Dean and Chief Academic Officer of the School of Arts and Sciences, Minerva Schools at Keck Graduate Institute. "He was very quick on the uptake, very confident, and unusually assertive. At one point he interrupted the speaker … [but] another student came to the rescue, with a trenchant rejoinder to Gordon's broadside. In fact, before Gordon was completely finished, the other grad student cut him off, and explained that there was another finding he was ignoring. Gordon listened carefully, head cocked to one side, nodded," and agreed with the student's remarks.

Many of Bower's former students and collaborators note these two complimentary traits in their letters of support nominating him for the APS Mentor Award: He is challenging yet supportive, demanding yet understanding, candid yet caring. He possesses that rare mix of qualities that has endeared him to so many of his mentees, including several who did not officially work in his lab but whom he nevertheless took under his wing.

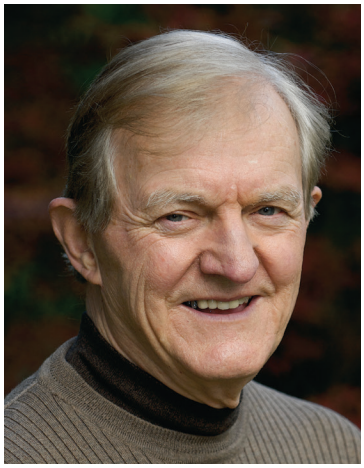
"Gordon was not my actual advisor during graduate school … but over the next several decades Gordon would come to play an important 'mentor' role in my life," recalls APS Past President Elizabeth Loftus, Distinguished Professor of Social Ecology and Professor of Law and Cognitive Science at the University of California, Irvine. "His role grew so large that when I'm now asked which scientists were particularly important to my own career development, I invariably mention Gordon."

Professional advancement is not the only area in which Bower, Albert Ray Lang Professor of Psychology Emeritus at Stanford University, has been generous. He is mindful of his students' personal needs as well.

Former student and APS Fellow Elizabeth Marsh, professor and associate chair of the Department of Psychology and Neuroscience at Duke University, recalls being nervous when Bower called her to his office one day. She relaxed once she realized the meeting was not about her research.

"He wanted to give me his scooter! Gordon knew that I did not drive, and he was concerned about my walking and biking home in the dark," Marsh says. "It was one of the sweetest moments of my graduate school career."

As encouraging and kind as Bower is, he is equally exacting and critical. He pushes his students to fine-tune their ideas and conduct rigorous research, working with them as equals in whose work he is personally invested. This means that "egos can be left by the door," writes APS Fellow David A. Rosenbaum, Distinguished Professor of Psychology at University of California, Riverside. "Ribbing and good-natured teasing can go on, bespeaking trust. It's your hypotheses and their predictions that are on the line, not your worth at every turn."



Others expressed similar sentiments: Bower can be strict, but he never makes it personal. Through his critiques, he aims to help his students "tear the weak [ideas] to shreds in the search for a gem," APS Fellow Lawrence W. Barsalou, University of Glasgow, explains. When they find that gem, Bower does all he can to help them polish and subsequently present it. Several letter writers emphasized how much it meant to them to have Bower attend their Psychonomic Society talks.

Rosenbaum recounts: "Gordon always went to all of his former students' talks at Psychonomics. Even if you hadn't seen or spoken to Gordon for a while, he would be there at your presentation, smiling and nodding no matter what, though he would also feel free to ask one of his zinger questions in the discussion period, always with a twinkle in his eye. He'd still want you to be able to think about the work critically."

Many of Bower's former students emphasize that he holds himself and his work to the same high standards. "Part of the mentoring went beyond assisting me in improving," APS Fellow Alan M. Lesgold, Renée and Richard Goldman Dean of the School of Education, University of Pittsburgh, remembers. "Gordon modeled the importance of peer critique as well, asking for comments on his own writing and asking for suggestions about articles being reviewed for journals. That second-level mentoring may explain why so many of Gordon's students have gone on to have decent research careers."

In the end, perhaps APS Past President Walter Mischel, who described Bower at the beginning of an "Inside the Psychologist's Studio" studio interview with him at the 21st APS Annual Convention, put it best: "For most distinguished psychologists, there's usually a phrase or two, or three maybe — at most a paragraph — if you try to capture what they're about [and] what their work is about. Most of us get characterized with a few simple phrases. It's impossible with Gordon. Even three paragraphs, four paragraphs, aren't going to capture either the person or the scientist. There's a complexity to this guy that really is not reducible to the usual pigeonholes."

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Lisa Feldman Barrett

Northeastern University

APS Past Board Member Lisa Feldman Barrett is a standard-bearer in the field of emotion research: She has altered the understanding of our inner lives to reveal that emotional expressions are varied within ourselves and between cultures. She has discovered that emotions do not "live" in certain brain structures (e.g., that fear is housed in the amygdala) and explored the neuroscience basis of emotions. Her book, *How Emotions Are Made: The Secret Life of the Brain*, has been described as brilliant, mind-blowing, and a delight to read by several experts in the field. Currently, Barrett is a University Distinguished Professor of Psychology at Northeastern University. She has research appointments at Harvard Medical School and Massachusetts General Hospital in Psychiatry and Radiology.

During her extensive and varied career, Barrett has mentored a great number of students and colleagues alike. Her colleague and APS Past Board Member Wendy Berry Mendes, a professor at the University of California, San Francisco, says, "Professor Barrett's work has been so impactful that she not only has made a name for herself but also a small army of professors, post-docs, and junior collaborators whom she has trained and collaborated with over the years."

Eighteen of Barrett's mentees have gone on to direct their own labs. Those she has mentored have won awards and honors that include the APS Janet Taylor Spence Award for Early Career Contributions, the Marie Curie International Outgoing Fellowship, the National Institutes of Health National Research Service Award, and the National Science Foundation CAREER Award.

Many of Barrett's mentees appreciate her insistence on robust critical thinking. She is known for giving direct feedback in a way that spurs her mentees to action.

"Lisa has created a scientific environment that is built on the idea of team research nested within a supportive community where all members are encouraged to take intellectual risks, aim higher, and learn from failure," says Morenikeji Adebayo, who was a junior research fellow with Barrett in the psychiatric neuroimaging program at Massachusetts General Hospital.

Barrett's mentoring also extends outside of the classroom and laboratory: She teaches her mentees about the skills that help advance a scientist's career and works to remove barriers for underrepresented students in psychology.

"I'm well aware of the statistics regarding female postdocs leaving academia," says Christy Wilson-Mendenhall, a former research scientist in Barrett's lab and associate scientist in the Center for Healthy Minds, University of Wisconsin-Madison. "Lisa continually reminds me that I'm more than capable of this next step, and offers very practical career advice for getting there. I'm so grateful to work with a mentor who, in addition to being a brilliant pioneer in the field, is so genuinely invested in her mentees' futures."

As a mentor, Barrett also cultivates well-roundedness and writing skills that will help students and colleagues chase their passions. Maria Gendron, a former doctoral student and current postdoctoral fellow in Barrett's lab, says: "She emphasizes grantsmanship, mentoring, and writing skills in her students so that they are not only prepared as intellectuals, but also as well-rounded scientists. Lisa is also incredibly generous with her students — consistently providing new opportunities for them to develop their own interests and strengths." Gendron will join the department of psychology at Yale University in the fall as an assistant professor.

Teaching the skills needed to succeed is certainly an important part of mentoring, but Barrett also demonstrates a deep commitment to her mentees, and they say her care for them is palpable:

"As a young assistant professor just starting my own lab, I got to see an example of what it means to care deeply for the well-being of one's mentees," says W. Kyle Simmons, a colleague of Barrett, principal investigator at the Laureate Institute of Brain Research, and associate professor in the School of Community Medicine at the University of Tulsa. "That sort of modeling is invaluable, I've never forgotten it."

Barrett also supports her mentees as they navigate the sometimes perilous path of scientific innovation. Science can sometimes feel like "a fight against ignorance and self-doubt," writes Kurt Gray, who was mentored by Barrett as a graduate student and young academic and who is associate professor at the University of North Carolina at Chapel Hill. "More than anyone I know," he says, Lisa fights "for truth, combining sharp intellectual honesty with deep compassion for her students. She is a leader who stands right next to her mentees during the firefight, and who would willingly take a bullet for those in her care." Through her guidance and support, Barrett encourages young scientists to follow their own scientific paths rather than following in the footsteps of others.

Adebayo says she hopes to model Barrett's mentoring style in her career. "There are a myriad of stressful personal and external factors that can impact an individual's productivity," Adebayo says. "Thankfully, Lisa is a full service mentor; we can talk to her about life and work. Both personally and professionally, she is our advocate. I've absorbed some of the lessons on how to mentor and teach students and I so look forward to a time when I am in a position to pay it forward."

Harry P. Bahrick

Ohio Wesleyan University

APS Fellow Harry P. Bahrick, now an emeritus professor of psychology at Ohio Wesleyan University (OWU), began his career at that institution in 1949. His undergraduate mentees have gone on to contribute to some 2,300 scholarly works that have been cited more than 85,000 times — the equivalent of nearly four citations every day since his first lab alumnus earned his PhD in 1955.

Bahrick's memory lab offered undergraduate students an opportunity to contribute to cutting-edge research on long-term memory in real-world situations — such as recalling the names and faces of high school classmates, foreign languages, and mathematics — when many in the field were still focused on how subjects memorized lists of words in a laboratory setting.

"Throughout his lifetime he's drawn talented people into the field and prepared them to succeed in graduate school and beyond. I couldn't have asked for a better mentor," wrote APS Fellow Robert Kail, a Distinguished Professor of Psychological Science at Purdue University.

Bahrick treated his students as far more than just "some inexpensive help to conduct studies," added APS Fellow John Dunlosky, a professor of psychology at Kent State University.

As a freshman in the late 1980s, Dunlosky thought he was out of options: Despite a 4.0 GPA, he could no longer afford to attend OWU.

"Harry changed my life," Dunlosky wrote. "Unknown to me, he had banded together a small group of faculty to plead my case, and later the next summer, he called my parents to tell them that he was able to convince OWU to give me a scholarship!"

Bahrick's approach to psychological science has also been unique in that, while many of the nation's leading experimental psychologists have chosen to pursue their interests at large research universities, he has remained at OWU throughout his career, wrote APS Fellow Ruth Maki, now a professor emeritus of psychology at Texas Tech University.

"This gave undergraduates there the opportunity to be involved in research of the highest caliber," Maki elaborated. "We were able to work side-by-side with a leading-edge researcher while attending a small liberal arts school."

Over time, Bahrick's commitment to both undergraduate education and his role as a "psychologist scientist evangelist" influenced the choice of students from chemical engineering, education, foreign language, and history backgrounds to pursue careers in experimental psychology. More than 60 OWU memory lab alumni have gone on to earn PhDs — a postdoctoral rate of nearly four out of five students — with many directly crediting Bahrick for their later success in the field, wrote Cara L. Wellman, director of the Center for the Integrative Study of Animal Behavior at Indiana University Bloomington.

"He has been instrumental in the early development of many successful careers in the psychological and brain sciences, including my own," wrote Wellman, who studied under Bahrick as a first-generation college student in the 1980s. "His mentorship was invaluable to me, and I am quite certain that I would not be a professor today if it weren't for his guidance."

This personal touch was typical of Bahrick as a mentor. Not only did he push his students to strive for publication and to present posters at APS conventions, less common benchmarks for psychology undergraduates at the time, but he personally recruited students like Tamara Daily, now a professor of psychology, neuroscience, and human development at the University of Mount Union, to study at OWU.

Through her classes and time as a research assistant at the memory lab, Daily quickly realized that, if she were to become a professor, she wanted to be one like Bahrick.

"Harry taught me that research and teaching are inseparable and that science should be less about the scientist and more about ensuring that discoveries will continue to be made long after any given scientist is gone," wrote Daily.

Furthermore, she explained, Bahrick took his mentees seriously as researchers. Lab meetings weren't about assigning marching orders or busy work — students were expected to keep lab notes, meet deadlines and, most of all, have their own opinions.

"Harry made it very clear to us that research is not something that just pops out of the heads of brilliant people," Daily wrote of Bahrick's philosophy. "It requires the collective efforts of people with varying experiences and backgrounds working in collaboration. It requires fits and starts and a high tolerance for failure. He also showed us that doing science is quite simply fun." ●

NEW BOOKS

Inventing Ourselves: The Secret Life of the Teenage Brain

by Sarah-Jayne Blakemore; Hachette Book Group, May 15, 2018.

AMPPS Makes Its Entrance

The first issue of APS's newest journal Advances in Methods and Practices in Psychological Science *(*AMPPS*) debuts this month. This one-of-a-kind journal publishes new types of empirical work and articles and tutorials that reflect the various approaches to research across the field. The journal's editorial scope encompasses the breadth of psychological science, with editors, reviewers, and articles representing a balance among diverse disciplinary perspectives and methodological approaches. Many of the articles are already online at http://journals.sagepub.com/toc/amp/0/0.*

In his editorial for the opening issue, AMPPS *Editor* ***Daniel J. Simons****, University of Illinois, discusses the journal's mission, its structure, and its leading role in advancing APS's overall leadership in fostering scientific transparency, openness, and reproducibility. Below is a reprint of that editorial, which also appears online at http://bit.ly/2BH1FoE.*

These are exciting times for psychological science. The past 7 years has seen a dramatic and field-wide transformation, with more and more people interested in evaluating and improving their own research practices and those of the field as a whole. Discussions of research practices have gone mainstream, and changes to research and publishing practices are happening faster now than at any point in our field's recent history. The primary mission of *Advances in Methods and Practices in Psychological Science* (*AMPPS*) is to foster such discussions of and advances in practices, research design, statistical methods.

For decades, experts like Cohen, Meehl, de Groot, Cronbach, Loevinger, and many others repeatedly raised concerns about small-sample studies, questionable research practices, poor design, noisy measures, violated statistical assumptions, flawed inferences, a lack of direct replication, and publication bias (Cohen, 1962; Cronbach & Meehl, 1955; de Groot, 1956/2014; Loevinger, 1957; Meehl, 1967). Although these problems linger, I am more optimistic about the state of our field now than at any earlier point in my career.

Less than 10 years ago, nobody had heard the terms "*p*-hacking" or "researcher degrees of freedom" (Simmons, Nelson, & Simonsohn, 2011) and few knew the problems with "HARKing" (Kerr, 1998).[1] Preregistration was rare outside of clinical trials; stand-alone direct replications were barely publishable; and multilab collaborations were uncommon. Badges and incentives for open practices were nonexistent. Facebook groups were not actively discussing research methods and practices. The Transparency and Openness Promotion (TOP) guidelines for publishing, spearheaded by the Center for Open Science and now adopted by more than 5,000 journals and organizations (including APS; https://osf.io/9f6gx/), had not yet been conceived. Few journals, funders, or societies had established guidelines for data sharing. Novel article formats such as Registered Reports — in which reviewers evaluate a study's rigor and design before data collection (Chambers, 2013; see https://cos.io/rr/ for more information) — were not yet among our publishing options.

In many ways, APS has been a leader in supporting improved research and reporting practices. With Bobbie Spellman as Editor, *Perspectives on Psychological Science* published a series of groundbreaking articles on research practices, and as Associate Editor, Alison Ledgerwood organized several special sections on research methods and metascience. *Perspectives* also launched Registered Replication Reports as a new way to evaluate the strength of evidence for important effects (Simons, Holcombe, & Spellman, 2014; *AMPPS* will be their new home). At *Psychological Science*, Eric Eich implemented changes to reporting practices to allow more comprehensive method and results sections and more transparent and complete reporting, and he incentivized transparency by awarding badges for open data, open materials, and preregistration. His successor, Steve Lindsay, has continued that tradition by adding consulting statisticians to the journal editing team, asking authors to make their data and materials accessible to the editors and reviewers, and requesting that authors report on their use (or nonuse) of open science practices (http://bit.ly/2C5HVaO). Steve Lindsay also adopted a variant of the Pottery Barn rule (Srivastava, 2012) by creating an article format for replications of studies published in *Psychological Science* (Lindsay, 2017). As editor of *Clinical Psychological Science*, Scott Lilienfeld also adopted badges and reporting standards that incentivize best practices.

Daniel J. Simons

The APS *Observer* magazine publishes a yearly methods issue along with articles and tutorials on a wide range of methodological and statistical topics (e.g., Bayesian analysis, sample-size planning, the "new statistics," R programming, and preregistration). And the annual APS convention includes a methodology track featuring presentations about research practices and practical, hands-on workshops intended to help psychological scientists improve their research. Those sessions have consistently drawn large crowds, especially early-career researchers.

In launching *AMPPS*, APS hopes to reach a broad audience, consolidating in a single outlet a range of novel approaches to experimentation (e.g., the Registered Replication Reports), papers on metascience and best practices, and tutorials on research methods and practices. Like all APS journals, *AMPPS* emphasizes both innovation and accessible communication, with a mandate to help researchers from across psychological science to improve the quality of their research and the rigor of our discipline.

➡

The Audience for *AMPPS*

Improved research practices require clear channels of communication between statisticians/methodologists and psychological researchers (Sharpe, 2013). Reaching the broad audience of researchers who want to improve their methods and skills is core to the mission of *AMPPS*.

Although *AMPPS* has "methods" in its title, it is not a traditional methods/statistics journal. Several excellent methods and statistics journals in psychology regularly publish state-of-the-art developments, but most target a readership of expert methodologists and statisticians; they speak to methodologists interested in research, not researchers interested in methods or researchers interested in research. In recent years, some have pushed for improved accessibility in order to reach a broader audience (Harlow, 2017). *AMPPS* makes broad access core to its mission. The primary audience for *AMPPS* is the broad spectrum of psychological scientists who are interested in learning more about methods and practices but who do not regularly read method journals. Unlike other methods-focused journals, *AMPPS* will not publish articles written exclusively for methods experts. Articles in *AMPPS* will convey important advances but will be written for research producers and consumers; it is a place to communicate innovative methods and to discuss practices in a way that is broadly understandable.

To ensure accessibility of the prose, the main text of all papers should be written in plain English, with all terms defined and explained. The prose should draw in researchers, helping them to understand core issues of relevance to them. *AMPPS* balances this need for accessibility with the importance of precision by encouraging the use of "in-detail" boxes where authors can convey the more technical content and equations necessary for a full understanding. These boxes are ideal for content that is not strictly necessary to understand the conceptual point of an article but that adds to a deeper understanding (e.g., glossaries of technical terms, worked case examples, derivations, proofs). Readers who choose to skip the in-detail boxes should be able to understand the main ideas in any article in *AMPPS*. The main text of the article should be a gateway to greater understanding — get a broad audience hooked and encourage them to learn more.

Types of Articles

The submission guidelines for *AMPPS* (http://bit.ly/2EPh3ig) include details about the types of articles and their required formatting. As of its launch, *AMPPS* accepts three main article types: general articles on research practices, empirical articles featuring innovative research methods and practices, and tutorials describing the "how to's" of a research method or practice. It will also feature special collections of invited articles, on occasion, to discuss and debate issues of broad interest in the field. For example, the first issue includes a collection of papers on making data as available as possible, focusing especially on cases in which making data publicly available is challenging for practical or ethical reasons. The second issue will contain a forum with practical and philosophical guidance on how to provide evidence *against* the presence of a meaningful effect.

General articles in *AMPPS* can address a wide variety of topics, including research practices, metascience, simulation studies, reinterpretation of earlier findings using new analytical approaches, evaluations and comparisons of different practices, critiques, debates, and so on. All should consider the practical importance of the issues for the practices of researchers across psychology. General articles may also include structured debates, collections of articles on a theme, methodological commentaries, or other more interactive content intended to convey different perspectives on a problem.

Empirical articles in *AMPPS* differ in scope/structure from those appearing in *Psychological Science* and *Clinical Psychological Science*. *AMPPS* will not publish single-lab empirical papers that have a natural home at other APS journals (except, perhaps, in cases where the focus is entirely on a methodological issue). Empirical articles appropriate for *AMPPS* should adopt novel approaches to research, often involving large-scale, multilab collaborations: consortium studies, adversarial collaborations, ManyLabs projects, Registered Replication Reports, and so on.

Empirical research published in *AMPPS* typically will have been preregistered. Note that preregistration does not preclude a complete and careful evaluation of the data and evidence; exploration is the engine of discovery and the source of new hypotheses even if it does not support confirmatory hypothesis tests (see Lindsay et al., 2016: http://bit.ly/2H1Njj5). Except in rare cases, authors of empirical articles should make all materials, code, and deidentified data as publicly available as possible. Some of these multilab empirical projects will be registered reports, undergoing review of the introduction, methods, and analysis plan prior to data collection, with provisional acceptance in advance of knowing the outcome (http://bit.ly/2Ebcu4F).

Tutorials are the most practical of the articles appearing in *AMPPS*. Some may provide an introductory overview of an important concept, and others will introduce new tools and techniques. They provide concrete guidance to researchers, allowing them to acquire new skills and better use existing ones. Like the other articles in *AMPPS*, tutorials need not focus exclusively on statistics and methods; they can also discuss broader issues like lab management practices and other practical issues that affect the field. Tutorials on practical techniques should be written with an eye toward adoption in research methods and statistics courses, and they should indicate any prerequisite skills or knowledge necessary to make use of them. They must cover topics that would be useful in many areas of psychology and not only to specialists within a subfield.

Standards for the Peer Review Process

The review process at *AMPPS* is modeled after the process used at *Psychological Science*. Each article is initially reviewed by the editor in chief and one or more associate editors to evaluate whether it is a fit for *AMPPS* based on whether or not it adheres to four core principles:

- **Accessibility**: Articles should be accessible to and understandable by nonexperts. Authors should aim to make their articles understandable to a first-year graduate student in psychology who has taken one or two introductory statistics courses.

- **Relevance**: Articles should convey why the contents are important to the field as a whole and not just to a small subset of the field. A core goal of *AMPPS* is to bridge subfields of psychology by communicating useful approaches developed in one area to the field as a whole. The ideal article will address both principles and practices using concrete examples that will be interesting to psychologists in any subfield.
- **Rigor**: Articles in *AMPPS* should adhere to and document their use of best practices in research methodology, statistics, and reporting.
- **Transparency**: Articles should adhere to principles of open science and transparency, both illustrating best practices and informing about them.

Articles that clear this editorial review stage will be sent for external review, and those that do not will be declined (i.e., "desk rejected"). In some cases, when the editors feel that a submitted manuscript could be revised to meet these core principles (e.g., if it could be rewritten to be more accessible to our audience), they may encourage a revision prior to external review. Once a paper proceeds to external review, the process is similar to that of other journals.

Although *AMPPS* does not have strict page limits for articles, the submission guidelines give guidance on the lengths for each article type, and authors should contact the editor prior to submitting a manuscript that exceeds those guidelines. Authors should keep introductory material focused on the specific issue addressed in the article, honing in on the key point quickly and concisely. For example, unless a paper is *about* the reproducibility crisis or is a historical review of closely related issues, it should not cover the "crisis" as background or motivation.

Concluding Thoughts

Twenty-five years ago, in an introductory graduate statistics course he cotaught with Don Rubin, Bob Rosenthal spoke of the importance of thinking in terms of real-world consequences and effect size rather than *p*-values. He highlighted the dangers of treating $p < .05$ as a magic threshold, the need for quantitative synthesis, and the ways that practices like optional stopping undermine inference. His admonitions about questionable practices and recommendations for improved ones made a lasting impression on me, but one bit of advice stuck with me more than any other: He told us that, as researchers familiar with such best practices, we would occasionally have to educate journal editors who might have misconceptions.

Psychological science is catching up to Bob and the many other luminaries who have promoted improved practices over the past 60 years. As the field debates best practices and develops new tools to test our intuitions and to improve research methods and statistics, I hope that *AMPPS* will help researchers across the field better their own methods and research skills. I look forward to learning from the many authors and reviewers who will contribute to *AMPPS*.

[1] "*p*-hacking" refers to many ways in which researchers might flexibly select analytical procedures to shift results from $p > .05$ to $p < .05$, capitalizing on researcher degrees of freedom and flexibility in analysis procedures that could inflate false positive rates (Simmons, Nelson, & Simonsohn, 2011). "HARKing" stands for Hypothesizing After Results are Known, treating what are actually unpredicted results as if they confirmed an a-priori hypothesis (Kerr, 1998).

Acknowledgments

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CALL FOR SUBMISSIONS OPENS MARCH 2018

ICPS 2019
INTERNATIONAL CONVENTION OF PSYCHOLOGICAL SCIENCE

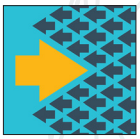
PARIS FRANCE 7 – 9 March

APS ASSOCIATION FOR PSYCHOLOGICAL SCIENCE

THE ASSOCIATION FOR PSYCHOLOGICAL SCIENCE PRESENTS THE

ICPS 2019 Integrative Science Symposia

ICPS is the culmination of efforts by APS and an international network of organizations and individual scientists to stimulate scientific advances that are integrative; that is, in which investigators attack scientific problems by drawing broadly on research conducted at multiple levels of analysis and in multiple branches of psychological science, the cognitive sciences, the neurosciences, and other related disciplines. The initiative has been designed, in essence, to surmount artificial disciplinary boundaries that can impede scientific progress and to highlight areas of investigation in which those boundaries have already been overcome.

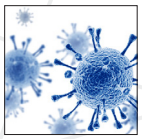


Changing Minds and Behaviours Throughout Society: The Greatest Challenge of Our Times

The question of how to change the minds of individuals or groups is a fundamental concern for a wide range of professions and academic disciplines. This integrative symposia will examine the state of the science on this complex issue and reflect on what professionals from various backgrounds can learn from each other's expertise on changing minds.

The Consequences of the Evolution of Language on the Mind

The emergence of language transformed human cognition, enabling our species to invent the Internet and travel to space. But what specific aspects of cognition have been changed by the evolution of language? We examine this question in a symposium that compares language across species and considers the consequences of literacy on the mind.



Our Minds Are Not Our Own: The Role of Guts and Germs

All complex life evolved from and co-evolved with microbes. Our microbiome impacts our cognitive and physiological health, and compelling evidence demonstrates that microbes and other pathogens still shape fundamental aspects of animal biology. These findings raise new questions about human behavior at the intersection of human and microbial biology. The speakers in this symposium provide state-of-the-art overviews of how microbes in our guts and germs in our environment shape our behavior.

Collective Emotions in Cooperation and Conflict

Sporting events, political rallies, religious gatherings, and street demonstrations all testify to the importance of collective emotions in social groups. Yet, the mechanisms and consequences of collective emotions remain poorly understood. This symposium addresses the factors that distinguish collective emotions from their individual counterparts, how these emotions contribute to the emergence and consolidation of social identities, and the role they play in the digital age.

WWW.ICPS2019.ORG

PARIS, FRANCE | 7-9 MARCH, 2019



Human Culture: What Is It and How Does It Work?

Culture has been credited for humanity's success as a biological species. Recent developments, however, suggest social learning—the capacity to learn from others—is not a uniquely human ability, but is distributed relatively widely in nature. How, then, is human culture different from cultures of other species? How did culture help humanity spread across the continents? What are the consequences of culture to cumulative cultural evolution and the future of humanity?

How Changing Our Bodies Changes Our Selves

No other period in history has seen such preoccupation with and dedication to the presentation, manipulation, and modification of the physical body—particularly its appearance—as a way to experience and socially share the self. This symposium takes a scientific perspective on the tension between identity and change at a time when technology increasingly helps us alter our appearance or present it to others.

From the Heart to the Eye: Interoception and Awareness

Contrary to the wealth of studies on external perception, interoception—the ability to perceive the internal state of one's body—has been neglected in psychology until recently. Promising new theories suggest interoception lies at the heart of our ability to perceive feelings from our bodies and provides our sense of self-awareness and well-being. This symposium brings together different research traditions on the topic of interoception that highlight how studying the ability to sense internal bodily changes may hold the key to understanding mental health, sociopolitical biases, and more.

Studying Perception: Is It Worth It?

The separation between perception and cognition is a basic distinction made in psychological education and can be found in any textbook. Recent data appear, however, to erase this distinction. For example, cognition appears to affect processing from the very first moments, and there appear to be reciprocal connections between most levels of neural processing. At the same time, it may be valuable to distinguish between top-down and bottom-up mechanisms. Given these breakthroughs in our understanding of how the brain works, is it time to drop the distinction between perception and cognition?

Integrative Science Symposia Speakers

Alyssa N. Crittenden
Aude Oliva
Bernard Rimé
Brian Scholl
Catherine Tallon-Baudry
Christian von Scheve
Dan Sperber
Dan Zahavi
Eran Halperin
Henrik Ehrsson
Henrike Moll
Jennie Pyers
John Bienenstock
John McGann
José Morais
Lera Boroditsky
Lisa Feldman Barrett
Manos Tsakiris
Marcus Feldman
Martin Paulus
Mats Lekander
Mel Slater
Miriam Haidle
Nichola Rumsey
Robert Dantzer
Stephen Fleming
Susan Michie
Yael Niv

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MARCH METHODOLOGY MADNESS

The *Observer*'s annual look at the trends and innovations in psychological research methods and practices

Preregistration Becoming the Norm in Psychological Science

By Brian A. Nosek and D. Stephen Lindsay

A methodological revolution is underway in psychology, with preregistration at the forefront. Methodologists have made the case for the value of preregistration — the specification of a research design, hypotheses, and analysis plan prior to observing the outcomes of a study. And indeed, it is hardly radical to hold that predictions should be specified before looking at the data.

Preregistration improves research in two ways. First, preregistration provides a clear distinction between confirmatory research that uses data to test hypotheses and exploratory research that uses data to generate hypotheses. Mistaking exploratory results for confirmatory tests leads to misplaced confidence in the replicability of reported results.

Second, preregistering may reduce the influence of publication bias on effect-size estimation. Journals favor submissions that report statistically significant effects, a bias that tends to inflate estimates of effect size in the published literature. If preregistrations are posted in searchable registries, then it is possible to discover all research on a topic, not just the research that got published.

Registries are available for depositing and discovering preregistration. An emerging research community is evaluating the extent to which scientists can embrace and practice preregistration. Many journals recognize articles reporting preregistered research with badges. A related trend is for journals to adopt Registered Reports, in which preregistrations are submitted for peer review before data collection begins.

As a consequence of all this, psychological scientists are preregistering research at unprecedented and accelerating rates. Change is happening, much of it driven by APS's journals, and there is plenty of guidance available for scientists wanting to adopt this practice. Here are some examples:

- Psychological scientist E. J. Wagenmakers and his colleagues provided the theoretical rationale for preregistration in "An agenda for purely confirmatory research" — one of the most cited articles from an influential 2012 special issue of *Perspectives on Psychological Science* on improving research practices: http://bit.ly/2BHj0Oo.
- In a 2016 *Observer* story, *Psychological Science* Editor-in-Chief Steve Lindsay, Dan Simons, Editor of the new APS journal *Advances in Methods and Practices*

Box 1: Incentives for Preregistration

Preregistration Challenge http://cos.io/prereg/
An education campaign for preregistration with $1,000 awards to 1,000 scientists for publishing the results of preregistered research.

Preregistration Badges http://cos.io/badges/
Signals of preregistered research in published articles offered by *Psychological Science*, *Clinical Psychological Science*, and 16 other psychology journals. In 2015, four *Psychological Science* papers earn a preregistration badge; in 2016, three did; and in 2017, 19 did.

Registered Reports http://cos.io/rr/
A publishing model in which peer review occurs prior to conducting the research. Offered by APS journals *Advances in Methods and Practices in Psychological Science*, *Psychological Science*, and more than 86 other journals. *Psychological Science* invites Registered Reports in the context of Preregistered Direct Replications.

in Psychological Science, and *Clinical Psychological Science* Editor Scott Lilienfeld reviewed the fundamentals of preregistration and described how it is being incorporated into publishing at APS journals: http://bit.ly/2H1Njj5.

- Brian Nosek and colleagues have just published "The Preregistration Revolution," an article in the *Proceedings for the National Academy of Sciences* addressing some of the pragmatic challenges for conducting preregistration, such as what to do when the data already exist or the study is multivariate or longitudina: https://osf.io/2dxu5/l.

Organizations in the social and behavioral sciences field have set up registries to make it easy to preregister. These groups include the American Economic Association's RCT registry, eGAP for political research, RIDIE for developmental economics, and the free workflow service OSF (http:osf.io) for any kind of research. Registries such as OSF enable researchers to embargo preregistrations so they can complete their research before making their designs publicly accessible. AsPredicted.com also provides an easy way to generate a preregistration, though it is not a formal registry because its preregistrations can stay private forever. That has the advantage of protecting researchers' privacy and the disadvantage of making some research nondiscoverable.

One might hope that researchers would preregister just because it is good practice, but presuming that would mean neglecting psychology's insights on behavior change. Adopting new behaviors is hard, particularly if they are unfamiliar and if the incentives counter the adoption. For example, maximizing publishability of findings encourages retaining as much flexibility in analysis and reporting as possible, even at the cost of the accuracy of the results. If preregistration is to be adopted widely, the incentives for doing it will need to outweigh the incentives against it. Some of that change is occurring already (see Box 1, p. 17).

The most direct incentive change is Registered Reports, which integrate preregistration with publication. Authors submit their question, methodology, and analysis plan for review before conducting the research. If accepted, that protocol is a preregistration of the confirmatory aspects of the study that will be published regardless of outcome as long as outcome-independent quality control criteria are met. The final paper clearly distinguishes between confirmatory tests and any exploratory findings that were examined after observing the data.

The growth in preregistration, demonstrated by the surge in journals encouraging preregistration by offering badges or Registered Reports and the total number of registrations accumulating on OSF, has been dramatic. From just 38 registrations in 2012 to more than 12,000 in 2017, registrations are doubling yearly (see Figure 1, page 21).

Psychology is not the only community adopting preregistration, but psychological scientists are leading the way in initiating the behavior and in evaluating its effectiveness for improving research practices. Ongoing self-study of research practices will foster continuous improvement and thereby accelerate the pace of discovering replicable phenomena and determining the factors that modulate their occurrence and size. ●

Box 2: Universities leading the Preregistration Challenge as of February 19, 2018. For the full list, visit http://cos.io/prereg/.

Rank	University	# of Researchers	# of Preregisrations
1	University of Oxford	24	34
2	Stanford University	17	29
2	University of California, Berkeley	17	25
2	University of Pennsylvania	17	25
2	University of Queensland	17	21
6	Washington University in St Louis	16	24
7	University of Michigan	15	20
8	University of Toronto	13	23
8	University College London	13	20
10	University of Southern California	11	24
10	Harvard University	11	21
10	University of Würzburg	11	21
10	Skidmore College	11	20
10	University of Texas at Austin	11	18
10	University of Edinburgh	11	17
10	Florida State University	11	14

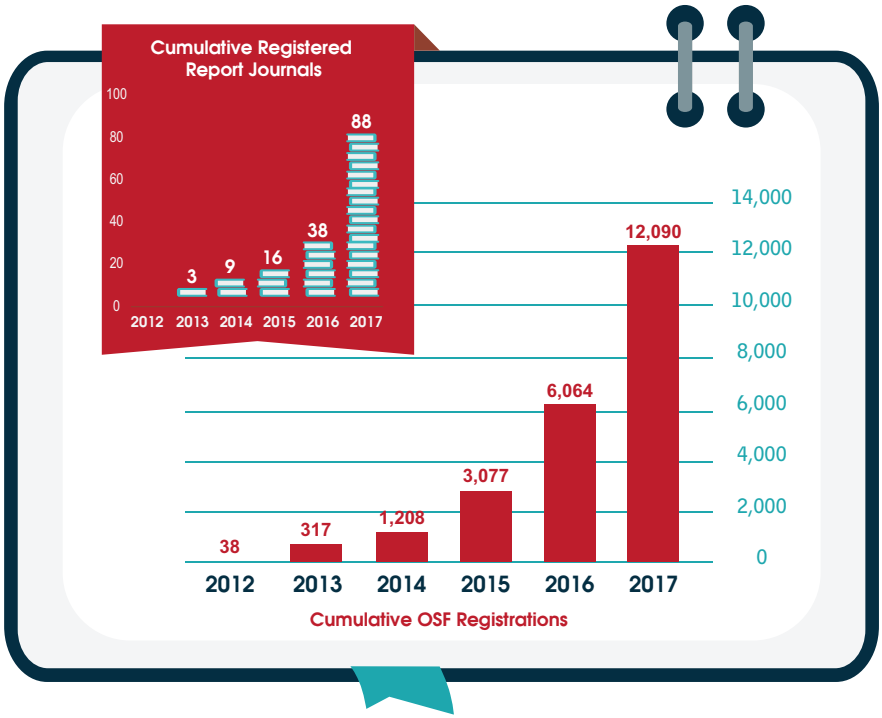

Figure 1

Experimenters' Expectations May Shape Priming Results

In a lab setting, experimenter expectations are already known to influence experiment outcomes — that is, researchers who hope to find significant effects may be more likely to find them. Understanding how these expectations may affect participant behavior is especially critical when observing social constructs. For example, social priming is a common construct in social psychology research. Studies have shown that activating a particular social concept, such as social status or age, can influence participants' behavior on a subsequent, unrelated task.

But some studies, including double-blind experiments, have failed to replicate such priming effects. This could indicate that a confounding factor, and not a prime, actually led to the priming effects observed in previous research.

In a study published in *Psychological Science*, researchers Erin Heerey and Thandiwe Gilder (2018) hypothesized that experimenter expectation could be one such confounding factor:

"If experimenters were aware of both participants' conditions and the research hypotheses, they may have inadvertently altered their behavior on the basis of this knowledge, thereby communicating expectations to participants."

Heerey and Gilder conducted five experiments, activating participants' awareness of social power to observe the effect of these primes and whether experimenter expectations mattered.

In the first experiment, a computer randomly assigned participants to receive a social power prime during a role-play task. In the high-power condition, participants were labeled the "boss" and were told that they had an added responsibility during the subsequent task. In the low-power condition, the participants were called an "employee" and were told that their boss has assigned them a particular responsibility (which was actually the same as for the high-power group). Following the priming task, participants completed an independent target-detection task called a flanker task.

The authors failed to find evidence of a power-priming effect on behavior during the flanker task, despite previous research showing a relationship between the two.

Experiments two through five investigated how a priming task affected participants' feelings of social power (high or low) while also manipulating experimenter knowledge about each participant's condition.

The experimenters were led to believe that they knew the participants' conditions. What they didn't know was that when they entered a high- or low-power prime condition into the computer, the computer would only assign the participant to that condition half of the time; the rest of the time, the computer assigned the participant to the opposite condition. Participants completed a scrambled-sentence task that primed feelings of low or high social power.

In all four experiments, participants also rated their experimenter's friendliness, competency, attractiveness, and trustworthiness in order to observe whether experimenter expectations influenced the participants' impressions of them and how these expectations would be communicated.

Participants in each experiment completed a different task measuring constructs that have previously been related to a power-priming effect.

In one experiment, participants received a list of common behaviors and then a choice of two descriptions, one concrete and one abstract. They chose the description that they believed best categorized the behavior.

The results strongly supported that participants' task performance was more likely due to experimenter expectation (i.e., the experimenter's expectations based on the condition to which they thought they had assigned a participant), rather than the expected priming effect (i.e., an effect based on the high- or low-power condition actually assigned).

The other three experiments — a word-categorization speed task, a risk-taking task, and an approach-behavior task — all yielded similar results, providing evidence for an effect of experimenter expectation on participant behavior.

Together, these findings highlight the importance of examining potential experimenter effects in psychological research. The authors note that when experimenters believed that participants were in the high-power condition, those participants tended to rate the experimenters as more trustworthy, attractive, and friendly. This suggests that the experimenters may have indicated something about the experimental conditions to participants without intention or awareness.

Heerey and Gilder emphasize that these results do not imply that priming tasks fail during all double-blind experiments, and they do not invalidate past priming research. However, they suggest a bit of skepticism toward "research that does not explicitly describe strong double-blind experimenting or measure for the effect of experimenter belief on participant behavior" if a double-blind design is not possible.

These findings have implications for best practices in experimental methods. Reducing the effects of experimenter expectation, such as by using a video to train participants, will allow for a more accurate understanding of priming and other social constructs.

Reference

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The Psychological Science Accelerator

By Chris Chartier, Randy McCarthy, and Heather Urry

The goal of psychological science is to generate reliable and generalizable knowledge about human thought and behavior. Researchers have traditionally conducted studies in independent, localized teams, which often result in relatively small samples collected at a single site. While this traditional approach has been quite effective for understanding some aspects of human psychology, it is often akin to stargazers trying to detect distant astronomical objects with weakly powered telescopes (e.g., Simonsohn, 2015) due to limited resources and access to participants.

To address the limitations of the single-site, small-sample approach, psychologists have started pooling individual resources into large-scale, collaborative, multisite projects (e.g., Many Labs, Pipeline Project, Registered Replication Reports). A stellar example is the Registered Replication Report model supported by APS. These projects involve several researchers from around the world who independently collect data about a previously published effect and pool their results into a publication-bias-free meta-analysis. The results of these projects are collectively much more informative than any of the individual samples could be. Effectively, psychological researchers can assemble "big telescopes" by coordinating their individually modest resources to generate highly informative results.

We would like "big telescope" studies to become commonplace in psychological science. To this end, the first author (CC) recently assembled a network of psychology research labs to regularly contribute to large-scale, multisite, collaborative studies. This network features (a) a democratic selection of studies to be conducted; (b) a diversity of researchers, participants, and research questions; and (c) a strong commitment to open and transparent science. This network has been dubbed the Psychological Science Accelerator (PSA) (https://psysciacc.wordpress.com/).

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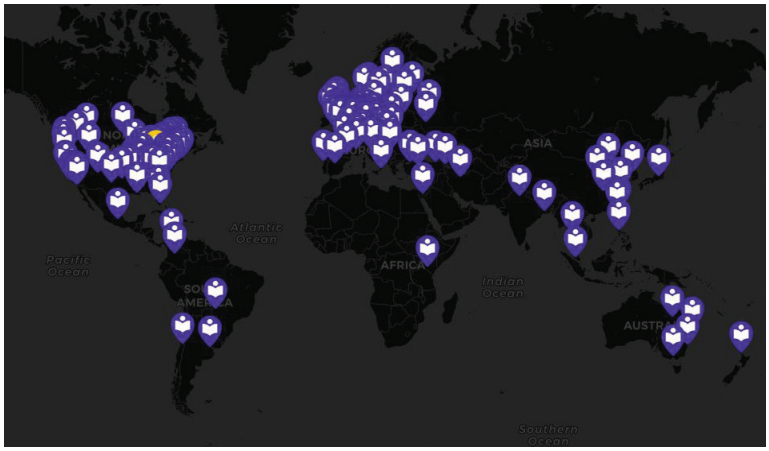
Randy McCarthy *is a research associate at Northern Illinois University's Center for the Study of Family Violence and Sexual Assault. He can be reached at rmccarthy3@niu.edu.*
Heather Urry *is an associate professor of psychology at Tufts University, where she directs the Emotion, Brain, & Behavior Laboratory. She can be reached at heather.urry@tufts.edu.*



This map illustration shows the number of labs, representing 44 countries, which are participating in the PSA network.

The Psychological Science Accelerator

The PSA is a distributed network of laboratories, numbering 207 as of January 30, representing 44 countries on all six populated continents. The network's mission is to accelerate the accumulation of reliable and generalizable evidence in psychological science, reducing the distance between truth about human behavior and mental processes and our current understanding. Inspired in part by Merton's scientific norms of universalism, communalism, disinterestedness, and skepticism, our mission is guided by the following core principles: (1) diversity and inclusion with respect to researchers, the locations and sizes of their institutions, and participants; (2) decentralized authority, where decisions at each stage are made by as many team members as possible; (3) transparency, by requiring and supporting practices such as preregistration, open data, analytic code, and materials; (4) rigor, both in the standards for approving individual studies and the process of managing the unique challenges of multisite collaborations; and (5) openness to criticism, by inviting and carefully considering critical feedback from both inside and outside the network, and adjusting policies and procedures as needed.

We have designed the PSA to reflect our mission and core principles. Specifically, our distributed laboratory network is **ongoing** (as opposed to time- or task-limited), **diverse** (both in terms of human participants and participating researchers), and **inclusive** (we welcome ideas, contributions, study proposals, or other input from anyone). In addition, our projects are well-positioned to **estimate effect size and heterogeneity** of psychological phenomena with rigor and transparency.

Ongoing network. While the Many Labs, Open Science Collaboration, Pipeline Projects, and Registered Replication Report efforts have had substantial success recruiting large numbers of data collection labs, they experience efficiency losses by having to recruit a new network of laboratories for each study. A key benefit of the PSA is that it is a *standing* network of laboratories, all of which are led by PIs who are willing to collect data for large-scale, multisite collaborations for the foreseeable future. We have recruited, and will continue to recruit, labs that can be matched with projects immediately and indefinitely. This will drastically reduce the amount of time between deciding upon a promising study and collecting data, thereby accelerating the pace of evidence accumulation.

Diversity. Our standing network of laboratories is broadly distributed geographically. As such, it will provide access to participant populations that are typically hard or impossible to recruit for most psychologists. As you can see from the network map (https://maphub.net/chartierlab/PSA), our team is global; all six populated continents are represented, and we have a moderate (and constantly growing) number of participating labs outside of North America and Western Europe, the most common sources of psychology research. We hope that this global diversity will allow us to begin to address psychology's longstanding "WEIRD" problem (Henrich, Heine, & Norenzayan, 2010) of relying heavily on undergraduate participants from Western, educated, industrialized, rich, and democratic societies.

Inclusion. We have designed the network to be maximally inclusive of global expertise by establishing an organizational structure that reflects a broad but cohesive set of committees charged with carrying out the network's mission and day-to-day activities. This structure reflects our interest in making decisions via decentralized authority. Committee members are nominated by network members and voted upon by the leadership team and the chairs of each committee. Mandates for committees that reflect a mix of subfield (heavily social and cognitive at first) and geographical (heavily North American and European at first) areas ensure broad representation along these dimensions. Staggered term limits ensure rotation in opportunities to contribute and representation of varying levels of expertise while still maintaining continuity over time.

Estimating Effect Size and Heterogeneity. One promising feature of our global network lies in its ability to aggregate relatively small investments by individual labs into massive data contributions to psychological science. For example, 50 labs (a very conservative example considering our recruitment progress to date), contributing 50 participants each (again, a relatively conservative participant count for most experimental labs) yields a total *N* of 2,500 participants for a single study. Further, this hypothetical sample would be more geographically diverse and is likely to be more demographically diverse than any individual sample. Large datasets such as these are necessary complements to the relatively small samples routinely collected by individual labs. They will allow us to precisely estimate the size and direction of effects and model variation in effects due to four classes of moderating factors, namely "(a) the strength of the intervention, (b) the choice of outcome, (c) characteristics of the participants, and (d) the setting and context of the study" (Shrout & Rodgers, 2018, p. 498). As these authors attest, "If effect heterogeneity is considered likely, then many smaller studies done at different times and in collaboration with other labs will be more informative about the heterogeneity than a single large study, although the smaller studies will individually be less precise" (Shrout & Rodgers, 2018, p. 500).

What's on Tap?

The first three projects that will be tackled by the Accelerator have been selected, and we are preparing for data collection. The first study will be led by Ben Jones and Lisa DeBruine of the University of Glasgow and Jessica Flake of York University. This study will test the generalizability of the valence-dominance model of face perception (e.g., Oosterhof & Todorov, 2008). The second study will be led by Curtis Phills of the University of North Florida. This study will examine whether men and women are equally represented in cognitive representations of minority social categories (e.g., when thinking of a "Black person," people are more likely to think of a Black man than of a Black woman). Finally, our third study will be led by Sau-Chin Chen of Tzu Chi University. It will examine the extent to which the object-orientation effect, in which language comprehension can guide later perception, extends across numerous world languages. For example, the picture of a flying eagle is identified faster after reading "He saw the eagle in the sky" than "He saw the eagle in the nest."

How to Get Involved

In sum, the PSA decouples theoretical contributions (solid theorizing, hypothesis generation, study proposals) from the means of data collection. The most promising ideas for the PSA can come from researchers with modest data-collection resources. This will make our work more inclusive of researchers from a broad range of institutions and will serve to diversify and strengthen the pool of participants and address important empirical questions that psychologists can attempt to study on a large scale.

If you are interested in learning more about the PSA, you can visit our website or contact the authors. We are always looking to welcome more researchers into this community. To join us, or to start receiving regular updates about our work (we warmly welcome "lurkers"), please fill out the brief form on the "Get Involved" page of our website. You can expect an email from us within 72 hours of signing up. Our initial email will outline some of the ways you can get involved without committing yourself to any specific contributions. Some example contributions, should you choose to get involved, include: collecting data, reviewing study submissions, serving on one of our operational or advisory committees, and providing feedback on the procedures, policies, and governance of the Accelerator. ●

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Run All the Models!

Dealing With Data Analytic Flexibility

By Julia M. Rohrer

Imagine you are trying to figure out whether the personality traits of firstborns systematically differ from those of younger siblings. You set about planning your analyses, a seemingly straightforward task that quickly raises a multitude of questions. Is there any need to control for third variables? How do you handle the fact that the number of siblings varies? What exactly does "firstborn" mean when some people have half- or step-siblings? And what about the age gaps between siblings — does it make a difference if the firstborn is barely a year older than the younger sibling compared with siblings who are separated by a gap of 10 years? Different answers to such questions will lead to different analyses.

What began as a simple question leads to a large number of potential ways to analyze the data, a large number of so-called "researcher degrees of freedom." The right data analytic strategy might hinge on details of the hypothesis or on additional assumptions. If the hypothesis is vague, or if we lack crucial pieces of theoretical knowledge to decide which set of assumptions is more plausible, various approaches to running an analysis might be justifiable.

Taken by itself, this is not problematic: There is no reason why there should be a single correct way to analyze data. But over the last several years, psychological scientists have learned that this flexibility can cause problems if it is tackled the wrong way. If researchers try different analyses and selectively report those that yield the desired outcome — most often, a "significant" effect with a *p*-value below the conventional threshold of .05 — the published literature may contain a substantial number of false-positive findings.

A coin-flip example shows how selective reporting can influence the conclusions we draw. Imagine I told you that I flipped a coin 10 times and that it showed heads 10 times in a row. I even show you video proof! You might suspect that the coin is rigged rather than fair: The probability of such a lucky streak using a fair coin is $p = 50\%^{10}$, only about 0.1% (i.e., $p < .001$).

Imagine you later found out that I had actually started with 1,000 coins, each of which I flipped 10 times. I selected the lucky coin from these 1,000 coins and presented it to you. Would you still suspect that this particular coin is rigged? Would you be willing to bet that the coin keeps showing mostly heads — in other words, that the peculiar pattern replicates? Probably not. If all 1,000 coins were fair, it is likely that at least one of them shows such a pattern. In fact, it is more likely to observe at least one such lucky streak than to not observe it.[1]

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Taking a closer look at the literature on birth order and personality, it seems that some researchers have (metaphorically speaking) tossed a few more coins than they have disclosed in their papers. In a 1999 paper, Harris pointed out this "divide-and-conquer" method of birth order research: "Significant birth order effects were found for males but not for females, or vice versa. Or for middle-class subjects but not for working class, or vice versa. Or for people from small families but not from large ones, or for high school students but not college-age subjects. Researchers thought of some ingenious ways to divide up the data. Birth order effects were found in one study only if 'firstborns' was defined as 'firstborns of that sex.' In another, birth order effects were found only for high-anxiety subjects."

Given these practices, it is no surprise that findings are often contradictory. In a 2017 study published in *Psychological Science*, Boris Egloff, Stefan Schmukle, and I tried to tease apart these conflicting findings, examining a literature that one of our reviewers described as "a complete mess." Given the large number of researcher degrees of freedom in birth order research, we used a data-analytic approach called Specification Curve Analysis, first described by Simonsohn, Simmons, and Nelson in 2015. The idea behind Specification Curve Analysis is simple: If you can come up with a large number of defensible ways to analyze the data, run all of them and evaluate the results *across* all analyses. This allows researchers to probe whether robust effects emerge across different analyses and whether the null hypothesis of no effect can be rejected.

We used data from the Socio-Economic Panel study (SOEP), a longitudinal study in which members of German households fill out a yearly set of extensive questionnaires. First, we had to decide which outcome variables to include. Over the years, the SOEP has asked respondents a hodgepodge of questions about their personality. We decided to look at the personality data that had been collected between 2010 and 2014.

We also needed to come up with reasonable ways to analyze the data to decide which model specifications to include — for this, we used the published literature as a guide. For example, we decided to include separate analyses depending on the number of siblings a respondent has, because effects that only occur in families of specific sizes have been reported in previous studies. Researchers have also suggested that the age gaps between siblings matter, so we tried different exclusion criteria, dropping siblings who were born too close in time and also those who were too far apart. Some studies control for age, others do not — we tried both. Combining all of these decisions led to at least 720 different models for each outcome variable.

We ran all of these models.[2] As you can imagine, this number of analyses creates a lot of output. One way to make sense of all these numbers is plotting a Specification Curve that visualizes the

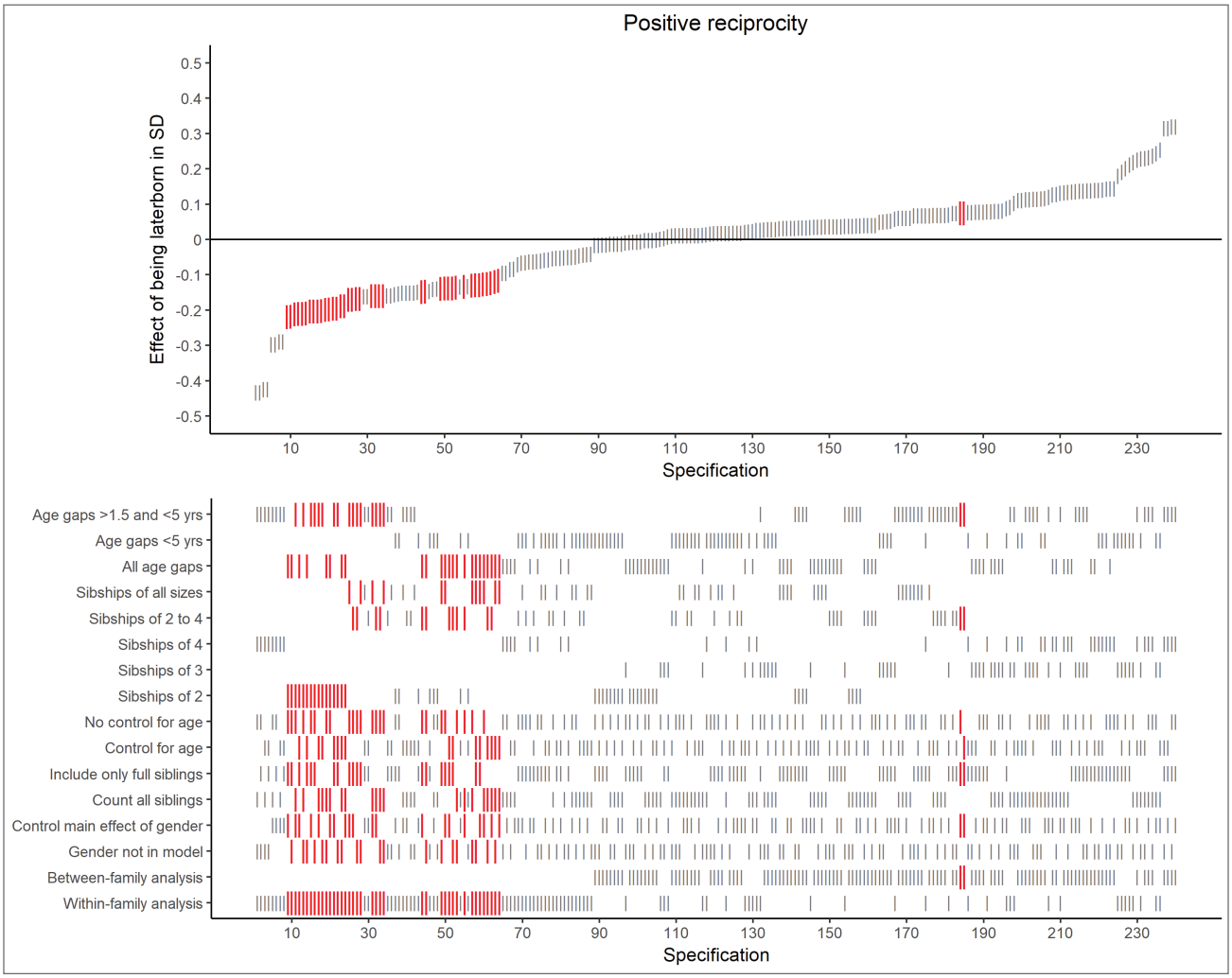

Figure 1. This Specification Curve reflects hundreds of models employed in research on birth order and personality. The red bars indicate that an effect passed the conventional significance threshold of $p < .05$.

estimated effects. You can see such a curve for the outcome variable "positive reciprocity" (a tendency to pay back favors) in Figure 1. The red bars indicate that an effect passed the conventional significance threshold of $p < .05$.

The effects that emerged were all over the place: Some indicate that so-called laterborns score lower on positive reciprocity, others indicate the opposite.

Hypothetically, we *could* have picked a single significant result and devised a just-so story, arguing that firstborn children are more likely to identify with parents who try to enforce norms of positive reciprocity among their offspring, so we expect them to have internalized these norms and thus to score higher on positive reciprocity.

If we had picked an effect pointing into the opposite direction, we could have explained it by suggesting that laterborn children crucially depend on social cooperation to defend their vulnerable position against the physically superior firstborn children, so we expect them to score higher on positive reciprocity.

As we now know, such an approach to data analysis is highly problematic because it favors findings that are not replicable. Instead, we looked at the bigger picture: Approximately 10% of the specifications result in a significant effect. Is that more or less than what we would expect by chance if there was no effect?

To answer this, we used a permutation test as suggested by Simonsohn, Simmons, and Nelson in their 2015 paper. We generated 500 data sets under the null hypothesis (no systematic effect of birth order) by randomly shuffling the birth-order position variable; then we compared the empirical Specification Curve to the simulated data. In the simulated datasets, birth order has been randomly assigned to individuals, and thus it cannot possibly correlate with their actual personality beyond chance variations.

For positive reciprocity, our empirical curve resulted in 10% "significant" specifications. Seventy-seven of the shuffled samples resulted in an equal (or greater) percentage of significant specifications, so the overall p-value is 77/500 = .154. According to this, the curve does not give us a strong reason to reject the notion that birth order has no effect on positive reciprocity.

Likewise, we found little evidence for birth order effects on a number of other personality variables, including negative reciprocity, life satisfaction, locus of control, risk taking, patience, impulsivity, and political orientation.

Specification Curve Analysis seemed particularly suited for this specific research question, but it is not the only way to deal with researcher degrees of freedom. For example, considerable analytic flexibility arises if outcome measures are not standardized. In such cases, having researchers agree upon and use a standardized version can prevent unreliable findings.

Flexibility might also arise during data collection, for example, if researchers peek at the results and decide whether or not to collect more data (or whether to label the study a "failed pilot"). In such cases, a detailed preregistration can tame researcher degrees of freedom.

Last but not least, more rigorous theories could partly fix the problem: If predictions are precise, data analysis becomes less arbitrary.

[1] The chance that a fair coin shows only heads when you flip it 10 times is 50%^10. Thus, the chance that the coin does not show heads 10 times in a row is 100%-(50%^10), or about 99.90%. Now, the chance that none of the 1,000 coins shows heads 10 times in a row is (100%-(50%^10))^1000, about 37.64%. That means that the chance that at least one of the 1,000 coins shows heads 10 times in a row is 100%-37.64% = 62.36%.

[2] Currently, there is no software package for Specification Curve Analysis, so I wrote some R scripts to do the job. You can find them on the OSF page of the article, but they are not particularly efficient and not easily modified. Uri Simonsohn has been working on a package, but this might still take some time. If you want to run a Specification Curve Analysis, I would recommend that you try to implement it yourself or team up with somebody with programming skills.

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Measurement Matters

By Eiko I. Fried and Jessica K. Flake

After a long and cold journey of 286 days, the *Mars Climate Orbiter* reached its destination on 23 September 1999. Rather than beginning its mission, however, the satellite disintegrated upon entering the atmosphere because one software module made calculations in US customary units and fed them into a second module that assumed metric units. Four years later, two halves of a large bridge being constructed across the Rhine came together to connect Germany and Switzerland. To the surprise of the engineers, there was a height difference of 54 cm (21 in) between the two sides: Different measurements of sea level had been used (the North Sea vs. the Mediterranean Sea).

Measurement problems can (and do) occur — sometimes with disastrous consequences — as part of even the most remarkable scientific endeavors, such as sending a satellite into space. We are in no different a situation in psychology as we navigate the shifts in our research culture toward a more open and rigorous science. So far, these shifts have largely ignored the topic of measurement, an unfortunate situation because the quality of measurement is even more foundational than statistical practice. A high-powered, perfectly parsimonious statistical model cannot save us from poor measurement.

In psychology, measurement is especially difficult because what we want to measure often does not permit direct observation. We can directly observe the height of a person next to us on the bus, but we often have little insight into latent, psychological attributes such as intelligence, extraversion, or depression. Construct validation — showing that an instrument meant to measure a construct actually measures the construct in question — is no easy task. Not only are psychological constructs difficult to observe, they are also complex. It is relatively easy to settle on which sea should be the benchmark for calculating height above sea level, but clearly defining intelligence, extraversion, or depression is challenging. There are different ways to understand and measure these constructs because they encompass different behaviors, perceptions, subjective experiences, environmental influences, and biological predispositions.

This article highlights the neglect of psychological measurement, explains why this poses a serious and underrecognized threat to the recent replicability efforts in psychological science, and concludes with some suggestions on how to move forward.

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Jessica K. Flake *is an incoming assistant professor at McGill University whose research focuses on tackling the theoretical and methodological challenges of measurement in psychology. She can be reached at kayflake@gmail.com and at @JKayFlake.*

The Problem: Neglected Measurement

To measure a psychological construct such as extraversion, psychologists often use questionnaires with multiple items. Items are added up to a score, and it is assumed that this score represents a person's position on the construct. From "Paul has a high score on an extraversion scale," we assume that Paul is very extroverted. This inference is not a free psychometric lunch; evidence of validity[1] is needed to support the claim. You want to have (1) a good theory supporting the items you include in your scale; (2) a scale showing acceptable psychometric properties (e.g., reliability and dimensionality); and (3) a scale related to other constructs in the ways hypothesized (e.g., convergent and discriminant validity) that captures group differences or causal processes expected to exist. Only if your scale meets these criteria can substantive inferences follow.

Unfortunately, evidence of validity is lacking in many areas of psychological research. As an example, depression is assessed in more than 1,000 research studies per year and is used as an outcome, predictor, moderator, or covariate across numerous disciplines (e.g., psychology, psychiatry, epidemiology). More than 280 different scales for assessing depression severity have been developed and used in research in the last century. Commonly used depression scales feature more than 50 different symptoms, and content overlap among scales is low. For example, one third of the symptoms in the most cited scale — the 20-item Center of Epidemiological Studies Depression scale (Radloff, 1977; approximately 41,300 citations) — do not appear in any of the other most commonly used instruments. The result is that different scales can lead to different conclusions, which has been documented many times in clinical trials. For instance, a recent clinical trial queried patients on four different scales to examine whether full-body hyperthermia was an efficacious depression treatment. The hyperthermia group showed significant improvements over placebo on only one of the four scales. Unfortunately, the authors reported the three null findings in the supplementary materials without mention in the paper. This is an important lesson: Although comparing results of multiple measures offers more robust insights, it also opens the door to *p*-hacking, fishing, and other questionable research practices.

There is more. Major depression had one of the lowest interrater reliabilities of all mental disorders assessed in the *DSM-5* field trials, with a coefficient of 0.28, and depression scales in general are often modeled without taking into account their multidimensionality and lack of temporal measurement

➡

invariance. Similar to the case of the *Orbiter,* these theoretical and statistical measurement issues can have drastic consequences, biasing conclusions of research studies and introducing error into inferences — inferences that influence the real-world behavior of scientists and resource allocation in science.

Depression is not an isolated example of poor measurement practices in psychological research. Reviews within specific domains cite similar issues (e.g., emotion; Weidman, Steckler, & Tracy, 2016), and our recent work suggests that poor practices span topics and subdisciplines. In a systematic review of a representative sample of 35 empirical articles published in the *Journal of Personality and Social Psychology* in 2014, we identified 433 scales aimed to measure psychological constructs. Of these, about half contained no citation to any validation study. For many scales, Cronbach's alpha was the sole psychometric property, and for one in five scales, no psychometric information whatsoever was reported. Simplified, evidence of validity, in practice, forms a hierarchy: (1) none, (2) alpha only, (3) a citation, presumably to another paper that contains validity evidence, and (4) more evidence, which takes a variety of forms. Further, we saw signs of researcher degrees of freedom, similar to the depression literature: Authors used multiple scales to measure one construct without justifying their use of a particular scale. We also noted that scale modification (adding or removing items) was common, as was combining multiple scales to a single index without a transparent rationale.

Poor Measurement Complicates Replications

Taking the results of these studies together, it is difficult to ignore the connection between poor measurement practices and current discussions about replicability. For example, Monin, Sawyer, and Marquez (2008) used a variety of scales in their study, which were also administered in the replication study as a part of the "Reproducibility Project: Psychology." However, the replication study identified different factor solutions in the primary measures, indicating that different items formed different factors. How are we to interpret the result of this study? Is it a theory failure, a replication failure, or a measurement failure? Again, these questions hold broadly. For depression, for instance, the factor structure of a given scale often differs across samples, across time in the same sample, and even in large subsets of the same sample.

If a scale lacks validity or measures different constructs across samples, there is little benefit in conducting replication studies. We must take a step back and discern how to define and measure the variables of interest in the first place. In such cases, what we need are validity studies, not replication studies. Our work to promote replicability in psychology will be stymied absent improving our measurement practices. Making replications mainstream must go hand in hand with making measurement theory mainstream.

Ways Forward

Norms are changing in psychology, and recent articles and publisher policies push psychological scientists toward more rigorous and open practices. However, contributions focusing on the connection between measurement and replicability remain scant. We therefore close with some nontechnical suggestions that we hope will be relevant to researchers from all subdisciplines of psychology.

- Clearly communicate the construct you aim to measure, how you define the construct, how you measure it, and the source of the measure.
- Provide a rationale when using a specific scale over others or when modifying a scale. If possible, use multiple measures to demonstrate either robust evidence for a finding or the sensitivity of a finding to particular scales.
- Preregister your study. This counters selective reporting of favorable outcomes, exploratory modifications of measures to obtain desired results, and overinterpretation of inconclusive findings across measures.
- Consider the measures you use in your research. What category of validity evidence (none, alpha, citation, or more) would characterize them? If your measures fall into the first two categories, consider conducting a validation study (examples are provided below). If you cannot do so, acknowledge measurement as a limitation of your research.
- Stop using Cronbach's alpha as a sole source of validity evidence. Alpha's considerable limitations have been acknowledged and clearly described many times (e.g., Sijtsma, 2009). Alpha cannot stand alone in describing a scale's validity.

Take the above points into consideration when reviewing manuscripts for journals or when serving as an editor. Ensure authors report the necessary information regarding the measurement so that readers can evaluate and replicate the measurement in follow-up studies, and help change the measurement standards of journals you work for.

We recognize that measurement research is difficult. Measurement requires both theoretical and methodological expertise. Good psychometric practice cannot make up for a poorly defined construct, and a well-defined construct cannot make up for poor psychometrics. For those reasons, it is hard to come up with a few quick fixes to improve measurement. Instead, we recognize that many psychologists may not have had training in validity theory or psychometrics and provide a list of resources for those interested in learning more. These include a collection of seminal materials on measurement and validation, as well as some accessible examples (https://osf.io/zrkd4).

In closing, we want to share the screenshot of the Wikipedia article on Psychological Measurement (see Figure 1), which auto-directs to the page for Psychological Evaluation.

We couldn't agree more: Measurement deserves more attention. ●

Figure 1. This screenshot of the Wikipedia article on Psychological Measurement auto-directs to the page for Psychological Evaluation.

The authors would like to thank Jolynn Pek, Ian Davidson, and Octavia Wong for their ongoing work in forming some of the ideas presented here.

[1] We acknowledge the old and ongoing philosophical debate about how to best define validity and measurement in psychology. A detailed discussion of validity theory is beyond the scope of this article and is described at length elsewhere (e.g., American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 2014; Borsboom, Mellenbergh, & van Heerden, 2004; Kane, 2013). Here, we discuss validity consistent with Loevinger's (1957) seminal work on construct validation.

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Optimizing Psychological Science's Impact on Public Health

An Introduction to the Society for Implementation Research Collaboration

By Cara C. Lewis, Madeline Larson, Brigid R. Marriott, Carrie B. Jackson, Caitlin N. Dorsey, Suzanne E.U. Kerns, Cameo Stanick, Maria Monroe-DeVita, Jill Locke, Aaron R. Lyon, Shannon Dorsey, Sara J. Landes

Researchers can spend decades building evidence to support behavioral treatments without ever seeing their work produce noticeable benefit to public health. The Institute of Medicine refers to this gap as the "Quality Chasm." The field of dissemination and implementation (D&I) science emerged to bridge this chasm, with the express purpose of translating discoveries from lab to practice. According to the National Institutes of Health (NIH), dissemination research is the study of targeted distribution and packaging of intervention materials. On the other hand, implementation research is the study of strategies used to integrate evidence-based practices into community settings to improve patient outcomes. Although D&I has existed as a field for fewer than 20 years, it has a dedicated journal (*Implementation Science*), a standing cross-cutting NIH study section (Dissemination & Implementation Research in Health), a twice-renewed NIH program announcement (R01, R34, and R21 mechanisms) with support from 18 institutes, and at least 42 initiatives devoted to advancing the field at the regional, national, and international levels.

The Society for Implementation Research Collaboration (SIRC) is one such initiative. SIRC originated out of a biennial conference series that began in 2010 with $150,000 from the National Institute of Mental Health (NIMH). Recognizing that D&I studies were proliferating in silos, SIRC's founders aimed to bring scientists and practitioners together in developing a research agenda centered on common measures, methods, and research principles. In doing so, they hoped to improve both the frequency and quality of evaluations of evidence-based practice implementation. SIRC became a formal society in 2015 and it now has more than 480 members from the United States, Canada, Great Britain, Canada, Ireland, Australia, Austria, Portugal, South Africa, Zimbabwe, Chile, Denmark, Norway, India, Jamaica, Kenya, the Netherlands, Pakistan, Sweden, and Singapore. The work being done by D&I researchers today has the potential to improve the lives of many — but, like any new field, D&I faces particular challenges that must be tackled.

Improving Measurement

Psychological scientists have long evaluated intervention fidelity, but the field has devoted less attention to other implementation outcomes such as acceptability, feasibility, appropriateness (i.e., compatibility with the given setting, stakeholders, or problem) adoption (i.e., a commitment or willingness to use a new practice), penetration (i.e., the extent to which a practice is integrated within a service setting), cost, and sustainability. The result is insufficient measurement tools; several outcomes have no measures, others have only invalidated tools, and those that do exist are difficult to locate. With NIMH funding, several SIRC officers created a repository of more than 400 measures of constructs relevant to implementation, as well as three new measures of implementation outcomes. Spurred by the belief that measures ought to inform rigorous research evaluation *and* guide practical implementation, this initiative also generated the Psychometric and Pragmatic Evidence Rating Scale (PAPERS), which helps users assess the quality of existing measures and develop new ones.

Growing the Workforce

To ensure that our burgeoning field continues to grow, we need to expand the roster of scientists with D&I training. A review of D&I training opportunities revealed that only 26 psychological scientists working in clinical psychology programs are potentially contributing to D&I training at

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the predoctoral level. And a recent social network analysis identified 20 D&I leaders who serve as sources of advice or who connect researchers in the field, only five of whom are psychological scientists and only *one* of whom works in a psychology department (and thus can train future psychological scientists). The other leaders have primary appointments in psychiatry, public health, or family medicine, or at a research institute affiliated with a large health system.

In response to this shortage, the Delaware Project was established in 2011 to help integrate D&I within a broader stage model, receiving joint sponsorship from the Academy of Psychological Clinical Science, NIMH, the National Institute on Drug Abuse, and the Office of Behavioral and Social Sciences Research. Given that many psychology departments do not house a D&I scientist, the Delaware Project works to accumulate resources, such as syllabi and lectures, and make them publicly accessible. To foster training across institutions, SIRC also offers a mentoring program composed of three tiers: students, new investigators, and established investigators. Each of the lower tiers receives one-on-one mentoring from the tier above, and the program matches mentors and mentees according to their research interests. The mentoring relationships focus on each mentee's specific needs, whether it's support with career development, grant writing, manuscript development, or other activities.

Balancing Study Design

In designing D&I studies, researchers must decide how to test evidence-based practices in real-world settings that present a variety of limitations. These decisions can be challenging to make, requiring researchers to balance concerns about internal and external validity. To facilitate the process, SIRC provides support to researchers and practitioners through conference-based and online workshops. These structured workshops provide a forum for presenters to pitch their projects in development, such as grant proposals or implementation practice projects, and receive feedback from the members of SIRC's network of experts. A mixed-methods evaluation of past workshops indicated that participants were very satisfied and that presenters had high rates of external funding (e.g., 35.3% of projects were funded; 41.2% were not funded; 23.5% planned to resubmit), often from NIH.

Establishing Mechanisms

While there are at least 61 models available to guide D&I studies, the field sorely needs theory to guide evaluation. Two systematic reviews examining implementation mechanisms identified 31 studies across seven countries, none of which empirically established a mechanism of change. Without theory, implementation targets and mechanisms have largely gone unarticulated, leading to a proliferation of multifaceted strategies that seem to take a "kitchen sink" approach. As a result, implementation strategies become increasingly complex and costly but not necessarily more effective with respect to the outcomes of interest. Being able to focus on components that are known to operate through established mechanisms allows implementers to streamline their strategies. SIRC continues to promote the study of implementation mechanisms to expedite progress in this critical area.

Connecting Stakeholders

The D&I work being done today cannot come to fruition if the stakeholders who study, carry out, and are affected by program implementation are not talking to one another. The activities mentioned above purposefully include all potential stakeholders with the aim of reducing the gaps between them. At the 2017 conference, SIRC invited policy makers, intermediaries, and practitioners to help guide the society in addressing this growing divide. Going forward, SIRC's conference will be cochaired by a researcher and a practitioner to ensure that the practical implications of research are clearly articulated. And we will continue to identify strategies for communicating the latest in implementation science to on-the-ground practitioners, to ensure that research informs practice and practice informs research.

SIRC is also developing a new interdisciplinary journal focused on behavioral health implementation. Tentatively titled *Behavioral Health Implementation Research*, the journal will invite manuscripts that feature a setting, outcome, or practice relevant to behavioral health. For instance, we welcome behavioral health implementation research across a wide spectrum of clinical and service settings, including specialty mental health, medicine, criminal justice, education, integrated care, and social services. We view behavioral health outcomes as including, but not limited to, mental health, substance use disorders, and social and role functioning, as well as comorbid chronic diseases. We are interested in behavioral health practices that are typically complex, multicomponent, psychosocial interventions. The Society's journal steering committee is committed to ensuring that the journal is governed by, contributed to, and consumed by both researchers and practice partners.

Bringing Psychological Science to the Table

SIRC's growth has been rapid and it parallels that of the larger D&I field, driven by the need to achieve a substantial return on taxpayer-funded research. The demand for D&I research by federal and foundation funders is strong and unlikely to go away. Given that the focus of this work is behavioral change, psychological science is foundational for much of D&I's knowledge and methods. Yet psychological science arguably does not have a proportional seat at the table despite an open invitation. Treatment developers continue to build efficacious interventions that could never "live" in the settings they were intended for because they fail to consider constraints at various levels, including those of the patient, provider, organization, system, and policy. Without D&I on the radar of psychological scientists, it is likely that we will continue to see a poor return on investment.

We invite you to join the conversation. ●

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Current Directions in Psychological SCIENCE

Teaching Current Directions in Psychological Science

Edited by C. Nathan DeWall and David G. Myers

Aimed at integrating cutting-edge psychological science into the classroom, Teaching Current Directions in Psychological Science offers advice and how-to guidance about teaching a particular area of research or topic in psychological science that has been the focus of an article in the APS journal Current Directions in Psychological Science. Current Directions *is a peer-reviewed bimonthly journal featuring reviews by leading experts covering all of scientific psychology and its applications and allowing readers to stay apprised of important developments across subfields beyond their areas of expertise. Its articles are written to be accessible to nonexperts, making them ideally suited for use in the classroom.*

Visit the column online for supplementary components, including classroom activities and demonstrations: www.psychologicalscience.org/teaching-current-directions.

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Why Word Frequency Matters

By C. Nathan DeWall

Brysbaert, M., Mandera, P., & Keuleers, E. (2018). The word frequency effect in word processing: An updated review. *Current Directions in Psychological Science, 27*, 45–50. doi:10.1177/0963721417727521

Sounding smart is the great obsession of many college students. Through every form of complication and experimentation, they use words used by few to communicate to many. But readers and listeners are savvy, and judge those who use long words needlessly as bumbling rather than brilliant (Oppenheimer, 2006). To sound smart, it might pay to take a different approach: Use simple, concrete language that communicates your message while putting your audience's mind at ease.

How do you do that? According to Marc Brysbaert, Pawel Mandera, and Emmanuel Keuleers (2018), begin by choosing words that people use frequently. More than 80 years ago, psychologists noticed that frequently used words took the least mental effort to understand (Preseton, 1935).

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You have an easier time understanding *artist* compared with *aardvark*, which is understood more easily than the nonword *Ockerbaijanian*.

Don't believe me? Let's use a concrete example. Have your students read the following three sentences:

1. He was always disappointed, always self-critical, always an artist.

2. The aardvark never knew life without food, without safety, without his normal routine.

3. He was unkind, unethical, unworthy of being called Ockerbaijanian.

Next, ask them to rate how easily they understood each sentence (1 = *not at all easy to understand* to 7 = *extremely easy to understand*) and the intelligence of someone who would write each sentence (1 = *not at all intelligent* to 7 = *extremely intelligent*).

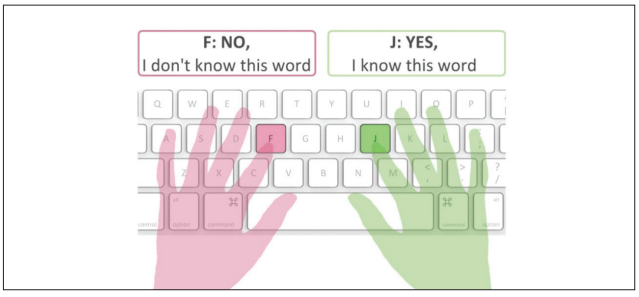
This is an extreme example, but it offers some telling discussion points. First, did your students show the word-frequency effect — that is, was it easiest for them to understand the first sentence? Did they also judge someone who would write that easy-to-understand sentence as highly intelligent? A second, hidden, point is that frequently used words enhance storytelling. Was it easier to imagine the inner workings of an artist than the daily activities of an aardvark? Did your students confuse the moral code of an Ockerbaijanian with that of an Uzbekistanian?

Now you can begin to see why word frequency matters. When we see a word, its frequency plays a major role in whether we recognize it (Brysbaert, Stevens, Mandera, & Keuleers, 2016). Word frequency also lightens the mental load involved in making semantic (*Does Ockerbaijanian refer to a person?*) and lexical (*Is Ockerbaijanian a word?*) decisions (Brysbaert et al., 2018; Monsell, Doyle, & Haggard, 1989). Use frequent words and your readers will love you, but not because you're the smartest person in the room. They will love you because your writing shows that you empathize with their dilemma: They want to learn but have limited mental energy.

Who is most sensitive to word frequency? It isn't people with limited intelligence (Brysbaert, Lagrou, & Stevens, 2017); it is people with limited language exposure (Monaghan, Chang, Welbourne, & Brysbaert, 2017). The more words you've encountered, the less your mind gets snagged on uncommon words. This makes intuitive sense. Imagine someone exposed to a million words and another person exposed to a thousand words. Which person will have to exert more mental energy to make sense of unusual words? The person who has seen fewer of them.

To bring this cutting-edge science to the classroom, have students complete Brysbaert and colleagues' short vocabulary activity. Ask students to use their smart devices to go to this link: http://bit.ly/1k31cKn. They will see the following instructions (which you can put on a PowerPoint Slide):

In this test you get 100 letter sequences, some of which are existing English words (American spelling) and some of which are made-up nonwords. Indicate for each letter sequence whether it is a word you know or not by pressing the F or J key. Please begin the task now.



Ask students to form pairs to share their results. Did they know more words than they anticipated? Fewer? Based on their results, how much should they show the word-frequency effect compared with their peers? Why?

People who sound smart commit time and energy to language. They expose themselves to as many words as possible, but they do not use needlessly long or complicated words. They communicate with empathy and appreciation for their audience, mindful of the power of frequent words to lessen mental load. And most of all, people who sound smart know when to end a sentence — even if they would rather go on.

Variations in Face Recognition Ability: Stable, Specific, and Substantial

By Gil Einstein and Cindi May

Wilmer, J. B. (2017). Individual differences in face recognition: A decade of discovery. *Current Directions in Psychological Science, 26*, 225–230.

When we think about the dimensions along which humans differ, we tend to think of physical features such as height, personality factors such as neuroticism, and cognitive abilities such as intelligence. We tend not to think of individual differences in face recognition, which is defined as the ability to learn new faces so that you can later accurately pick them out among distractors. After all, we have had so much experience recognizing the faces of family, friends, and casual acquaintances that we feel like experts. In almost all situations, face recognition seems instantaneous and sure.

Most of us have heard of the extreme face recognition problem of prosopagnosia, which is a major impairment in the ability to recognize familiar faces. When looking at a face, people with prosopagnosia can see the features of the face in front of them and can even recognize that they are looking at a face, but can't determine whose face it is. People with prosopagnosia rely on other information (such as the person's voice or hairstyle) for recognition, but these cues are not always present and tend to be less effective. Indeed, as one parent with prosopagnosia stated, "When my son started school, I dyed his hair so I'd know which kid was mine without having to be a detective every day" (Duchaine, 2015, p. 3).

To sensitize students to difficulties in face recognition, construct a slide with faces of six familiar people (e.g., actors, politicians, local celebrities, and perhaps a student from the class or even a picture of you). Then, present these faces upside down and ask your students to determine how many faces they can identify. Despite clearly seeing the faces and their features, students will have difficulty identifying them. Next, present the faces right side up, and recognition should be immediate. If students want to know more, you can point them to a 2012 "60 Minutes" story on prosopagnosia: bit.ly/2DXZaAE.

Beyond the extreme difficulties of prosopagnosia, are there individual differences in face recognition? Jeremy Wilmer, in his *Current Directions in Psychological Science* article, makes a compelling case that there are, and that understanding these differences has important theoretical and practical implications.

You can help students think about how psychologists typically measure face-recognition ability by taking them through several trials of the Cambridge Face Memory Test (http://bit.ly/2scveeO). The early trials are easy, and you should encourage students to take the 10-minute test on their own so as to get feedback on their face-recognition ability relative to the average score. You then can review some of the findings that Wilmer summarizes about face-recognition ability:

1. *People differ.* There is wide natural variation in face-recognition ability, ranging from people who have great difficulty recognizing faces (in the absence of brain damage; called developmental prosopagnosia) to people who are super-recognizers and can remember faces from even casual encounters years earlier. These variations are stable over time and are normally distributed.

2. *It's unrelated to other abilities.* Face recognition appears to be a highly specific ability that is largely independent of other cognitive abilities. Specifically, face recognition shows no correlation with IQ and limited correlations with verbal and visual recognition memory, thereby suggesting that different brain mechanisms are responsible for face recognition (Yovel, Wilmer, & Duchaine, 2014).

3. *It has a strong genetic basis.* Face-recognition ability has a strong genetic basis. Evidence for this comes from the finding that face-recognition difficulties tend to run in families as well as research showing much higher correlations in face recognition ability between identical twins (.70) than between fraternal twins (.29) (Wilmer et al., 2010). Wilmer (2017) concludes that about 68% to 97% of the variability in face recognition is due to genetic factors.

4. *It's not trainable.* Face recognition ability seems not to be substantially affected by training, even with adaptive training programs taking place over 29 sessions (Dolzycka, Herzmann, Sommer, & Wilhelm, 2014)

5. *Developmentally, it's up and down.* Face-recognition ability improves substantially from the age of 10 to the age of 20, then peaks at the age of 32. After that, it slowly declines (Wilmer, 2017; see Figure 3 of Germine, Duchaine, & Nakayama, 2011, for average performance across age or access this figure's raw data at https://tinyurl.com/cfmtdata).

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These findings can serve as a foundation for discussing potential practical implications. One interesting possibility, raised by Wilmer, is to encourage certain professions to hire people based on their face-recognition ability. For example, Scotland Yard found that officers who had high face-recognition ability were much better able to identify criminals from public video cameras than were their counterparts. As students discuss this issue, they may want to consider whether such a screening test should include more diverse faces.

Another possibility, based on research showing that scores on the Cambridge Face Memory Test predict eyewitness identification (Andersen, Carlson, Carlson, & Gronlund, 2014), is that eyewitnesses should be tested for their face-recognition ability. Also, given that matching photo IDs to faces is difficult, security officers might be hired on the basis of their face-recognition ability (Duchaine, 2015). Students also might be asked to consider how face-recognition ability affects a person's social interactions and how changes in this ability across the lifespan might affect older adults.

Psychologists often focus on studying similarities, such as the conditions that prompt most people to help a stranger, among individuals. It is important for students to realize, however, that individual-differences research is also revealing. By studying how we differ on an ability and what variables are and are not associated with those differences, we gain a deeper understanding of that ability — an understanding that often has practical implications. ●

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Studying Underrepresented Groups

Barriers to Productivity and Practical Suggestions

By Taylor Ballinger

Across disciplines, there has been renewed attention to the experiences of stigmatized group members within social, educational, healthcare, and law enforcement contexts. Basic and applied research in psychological science can increase the quality of intergroup relations and improve the experiences of underrepresented group members. Specifically, research on both majority and underrepresented groups benefits psychological science by fully illuminating the interpersonal dynamics that shape these interactions (see Shelton, 2000). Full understanding of the antecedents, mechanisms, and consequences of these processes can facilitate interventions that improve the experiences of majority and minority group members (e.g., Devine, Forscher, Austin, & Cox, 2012; Walton & Cohen, 2011).

Despite the benefits of studying underrepresented groups, several factors can deter graduate students from pursuing this line of study. In this article, I first outline barriers that can present obstacles to research on underrepresented groups. Then I offer practical suggestions for planning research design, obtaining resources, and accessing participant populations that can accelerate the rate of data collection for graduate students conducting research with underrepresented groups.

Barriers to Productivity

The primary consideration in conducting research on underrepresented groups is that their members are, unsurprisingly, numerically underrepresented. As a result, researchers who sample minority group members collect data at a slower rate and require greater resources than those who poll majority group members.

These considerations are compounded by recent debates surrounding best research practices in psychological science. For example, several special issues of leading journals call for increased sample sizes (Asendorpf et al., 2013; Lakens & Evers, 2014). While increased sample sizes lead to more accurate estimates of effect sizes and increase statistical power, these recommendations present a particularly burdensome responsibility on researchers wishing to study underrepresented groups (see Funder et al., 2014), particularly in the use of time-intensive methods (e.g., longitudinal design, dyadic interaction).

These concerns are further complicated when considering the incentive structure of the academic job market. Today's academic jobs require CV's with more publications, collaborations, and ongoing research projects than those before. Likewise, reviewers and editors have raised their expectations for the number and quality of studies required to document and explain an effect (Maner, 2014). Taken together, these trends incentivize graduate students to conduct research using quick, resource-efficient methods — a strategy that is less amenable for researchers wishing to study underrepresented groups.

In response to these logistical challenges, graduate students can implement several steps to increase the rate of data collection for research examining minority populations.

Practical Suggestions

Optimize your research design and methods. Though the method should ultimately follow from the theory and research question, several design factors can accelerate the rate of data collection. For example, employing a within-subject or repeated-measures design can decrease the number of participants needed to complete a particular study. Likewise, research paradigms that allow investigators to run multiple subjects simultaneously, such as computer-based tasks instead of single-participant sessions, will enhance the rate of data collection. Beyond design, how researchers structure and manage a study can affect this factor as well. For example, weighted incentives can discourage attrition in longitudinal studies by structuring compensation in a way that encourages full participation (e.g., $5 for Time 1, $5 for Time 2, and $20 for Time 3). Furthermore, sending email or text reminders 24 hours before study sessions can significantly reduce the no-show rate, allowing researchers to maximize their resources.

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Recruit paid participants. Since the subject pool of typical universities does not usually boast significant numbers of diverse or underrepresented populations, expanding participant recruitment beyond a departmental group can increase the rate of data collection. However, one barrier for graduate students is the ability to compensate paid participants. A natural first step is to ask your advisor for research funds. Additionally, several other resources can provide graduate students with funds to compensate participants. For example, universities often have area, departmental, or college-wide grants available exclusively for graduate students. Many universities also have unique funding available for undergraduate students wishing to conduct research. Collaborating with an undergraduate student not only provides valuable mentoring experience, it also increases graduate students' access to research funds that wouldn't otherwise be available.

In addition to internal funding sources, several professional organizations offer seed money for graduate students. For example, the American Psychological Association has 86 grant opportunities available to predoctoral candidates (American Psychological Association, 2017). Other funding sources include the Association for Psychological Science, the American Psychological Foundation, and the Society for the Psychological Study of Social Issues, all of which provide small grant opportunities that can be used to compensate paid participants.

Modify method of study administration. Beyond research design and having the necessary resources, graduate students can still encounter difficulties accessing sufficient num bers of potential research subjects. One potential solution is to administer the study online. If the theory and research question can be tested in an online setting, Amazon's MTurk online survey platform and Qualtrics Research Panels offer access to thousands of underrepresented group members. While MTurk does not allow you to post studies for a certain demographic, a screening survey can be set up to identify eligible participants based on almost any criterion. Furthermore, both TurkPrime and Qualtrics Panels allow researchers to select certain demographic characteristics of potential subjects for an additional fee.

Apart from the online format, expanding recruitment beyond your psychology departmental subject pool can increase access to underrepresented groups. Researchers can send inquiry emails or Facebook messages to student organizations or fraternities and sororities that cater to the particular characteristics of their research subjects. Additionally, graduate students can form relationships with institutional stakeholders that cater to the desired population. For example, setting up a meeting with a representative of the university's office of diversity or with an administrator in a particular department can increase access to minority groups. Forming connections with these institutional stakeholders can expand recruitment channels by connecting you with faculty, staff, and academic advisors who serve specific subsets of the population.

Beyond local partnerships, liaising with collaborators at other universities can be an effective way to get in touch with underrepresented groups. Some institutions cater exclusively to certain demographics (e.g., single-sex colleges, historically Black colleges and universities) that can increase access to specific participant populations. Additionally, certain schools can have an overrepresentation of some demographics based on the school's geography or culture. Forging relationships with such institutions at conferences can accelerate research projects and offer chances to form connections with external collaborators. Lastly, community samples can provide greater access to underrepresented or diverse populations. Urban locations, such as train stations, airports, medical clinics, or governmental agencies feature diverse populations who usually are waiting in line and may be willing to participate in quick surveys. ●

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GRANTS

Behavior, Energy, and Climate Change Conference
The Behavior, Energy, and Climate Change (BECC) conference invites psychological scientists to submit presentations, posters, or panels for its upcoming conference October 7–10, 2018, in Washington, DC. BECC is a conference focused on understanding the behavior and decision making of individuals and organizations and using that knowledge to accelerate a transition to an energy-efficient and low-carbon future. The theme of the 2018 BECC conference is "Building Bridges," which emphasizes the role that the behavioral sciences can play in achieving solutions to climate change. Visit https://becconference.org/ and submit by April 15, 2018.

Funding Opportunities for Research on Methodologies for STEM Education
The National Science Foundation (NSF)'s Directorate for Education and Human Resources (EHR) Core Research Program has released a new letter detailing opportunities supporting psychological scientists and others who wish to study methodologies supporting inferences in STEM (science, technology, engineering, and math) education. Interested scientists should visit the NSF EHR Core Research Program site for more information on how to submit a grant proposal. Full proposals are due September 13, 2018; however, researchers can submit for conference grants as well as the EAGER funding mechanism (designed to support exploratory work) throughout the year. For more information, visit nsf.gov/funding.

NIH Funding Announcement for Methodology Research
The National Institutes of Health (NIH) has released a new funding opportunity announcement designed to support research on methodology and measurement in the behavioral and social sciences. NIH is supporting research on methodology and measurement via the R21 grant mechanism, which is a 2-year grant for exploratory or developmental research providing up to $275,000 in direct support. NIH encourages applicants to contact one of the many NIH Institutes or Centers participating in the funding announcement which matches the research focus of the proposed project before applying for funding. The participating Institutes and Centers are: Office of Behavioral and Social Sciences Research, National Cancer Institute, National Eye Institute, National Institute on Aging, National Institute on Alcohol Abuse and Alcoholism, National Institute on Deafness and Other Communication Disorders, and the National Center for Complementary and Integrative Health. Applications are due June 16 or October 16, 2018, depending on the proposed project.

MEETINGS

2018 Anxiety and Depression Conference
April 5–8, 2018
Washington, DC, USA
adaa.org/resources-professionals/conference/registration

2018 Cognitive Aging Conference
May 3–6, 2018
Atlanta, Georgia, USA
cac.gatech.edu

7th International Congress on Interpersonal Acceptance and Rejection
May 15–18, 2018
Athens, Greece
isipar2018athens.panteion.gr

30th APS Annual Convention
May 24–27, 2018
San Francisco, California, USA
psychologicalscience.org/convention

Administration for Children and Families' National Research Conference on Early Childhood
June 25–27, 2018
Arlington, Virginia, USA
nrcec.net/

25th Annual RAND Summer Institute
July 9–12, 2018
Santa Monica, California, USA
rand.org/labor/aging/rsi.html

Biennial International Seminar on the Teaching of Psychological Science
July 9–13, 2018
Paris, France
bistops.org

3rd International Convention of Psychological Science
7–9 March 2019
Paris, France
icps2019.org

REDEFINING 'ACADEMIC SUPERSTARDOM'

Photo credit: Jacq Roos

*Tilburg University methodology expert **Angélique Cramer** believes academia, much like a soccer team, should celebrate its stalwart defenders as much as its superstar strikers.*

Your work advances our understanding of mental disorders from a network perspective — how did you come to this line of research? (Did you start with an interest in clinical issues? Or did the interest begin with statistical modeling?)

I started with an interest in clinical issues, forensic psychology in particular. During my Research Master I did my internship in a forensic psychiatric hospital, comparing low versus high psychopathic patients on their performance in the Iowa Gambling Task, a measure of how people process risk and emotion. My methodological interest was sparked during this time period: I loved the methods courses but I also became increasingly frustrated with the way in which mental disorders were conceptualized.

You already have many achievements in publishing, grants, and fellowships. Recently, you wrote about the importance of "slow science" and about being able to take time to think about "big" questions. Are the two compatible?

The two things are not inherently incompatible, but the combination requires the development of a particular skill: saying "no." That is, in order to carve out the time needed for thinking about "big" questions, I think it is essential to pick one's battles, guided by one's personal goals. For example, I do not review 30 papers per year and I do not accept every collaboration request. In addition, I block time in my calendar during which I'm not available for meetings; that is my research time. I realize that this is easier said than done, especially if one is still on the tenure track, as the system seems to require from us that we do it all and at a near-perfect level.

You were recently elected to the Young Academy of the Royal Netherlands Academy of Arts and Sciences — are there particular goals or issues that you hope to address as a member?

One important goal is to think critically about and initiate change in our current academic system. Comparing academia to one big soccer team, I think that we always will have [Cristiano] Ronaldo-like academic superstars. However: 1) we live in the illusion that there is only one definition of an academic superstar (e.g., many grants, publications in top journals, etc.); and 2) we are not doing very well in terms of rewarding colleagues who are essential for the success of a team yet are not attackers but, say, left defenders.

As a scientist who also maintains a public presence through ongoing blogs and columns, you clearly value science communication. Do you think the field is changing in how it views/values these kinds of nonresearch ("extracurricular") activities?

Yes, the field is changing; nonresearch activities are increasingly appreciated. On the one hand, rightly so: It is important to, wherever relevant, communicate with a larger audience. We are paid by them to do our jobs. On the other hand, I worry that nonresearch activities will become yet another performance box that has to be ticked in order to advance one's career. We have far too many boxes to tick already: Engaging in science communication should be an added bonus to one's profile, not a requirement, and certainly not an HR instrument.

You've written about "impostor feelings" and how they are very common but little discussed. How do we make owning and sharing imperfections — the so-called "CV of failures" — more acceptable? How have you dealt with your own impostor feelings since writing about them?

Being frank about one's own imperfections is a modest yet meaningful way to start. Just bring your whole person to work, not the vignette that is represented in your CV. I readily share my personal story with colleagues — for example, the fact that I have suffered from burnout. It also would be helpful if various application forms — for grants, nominations, etc. — would include a paragraph in which one is asked to reflect on fruitful areas for personal growth, or on grants/nominations that did not pan out. How I deal with my impostor feelings? Trying to accept that they are there. ●

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