<table>
<thead>
<tr>
<th>Integrate Science Symposia</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Our Social Brain: Neurobiology of Human Interactions</strong></td>
<td><strong>The Science of Successful Aging</strong></td>
<td><strong>The Push and Pull of Values and Behavior</strong></td>
<td></td>
</tr>
<tr>
<td>Chair: Piotr Winkielman, Department of Psychology,</td>
<td>Chair: Corinna E. Loeckenhoff, Department of Human Development,</td>
<td>Chair: Qi Wang, Department of Human Development, Cornell</td>
<td></td>
</tr>
<tr>
<td>University of California, San Diego, USA</td>
<td>Cornell University, USA</td>
<td>University, USA</td>
<td></td>
</tr>
<tr>
<td>Christian Keysers, Social Brain Lab, Netherlands Institute</td>
<td>Monica Fabiani, Department of Psychology, University of Illinois</td>
<td>Chi-yue Chiu, Department of Psychology, The Chinese University</td>
<td></td>
</tr>
<tr>
<td>for Neuroscience, and Department of Psychology, University</td>
<td>at Urbana-Champaign, USA</td>
<td>of Hong Kong, China</td>
<td></td>
</tr>
<tr>
<td>of Amsterdam, The Netherlands</td>
<td>Teresa Liu-Ambrose, Department of Physical Therapy, University</td>
<td>Heidi Keller, Department of Psychology, Osnabrück University,</td>
<td></td>
</tr>
<tr>
<td>Brian D. Knutson, Department of Psychology and</td>
<td>of British Columbia, Canada</td>
<td>Germany</td>
<td></td>
</tr>
<tr>
<td>Neuroscience, Stanford University, USA</td>
<td>Denise C. Park, Center for Vital Longevity The University of</td>
<td>Walter Mischel, Department of Psychology, Columbia University,</td>
<td></td>
</tr>
<tr>
<td>Claus Lamm, Faculty of Psychology, Department of Basic</td>
<td>Texas at Dallas, USA</td>
<td>USA (Discussant)</td>
<td></td>
</tr>
<tr>
<td>Psychological Research and Research Methods University of</td>
<td>Karl A. Pillemer, Department of Human Development, Cornell</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vienna, Austria</td>
<td>University, USA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rebeccal Saxe, Department of Brain and Cognitive Sciences,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Massachusetts Institute of Technology, USA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Who’s In, Who’s Out? Loneliness, Exclusion, and</td>
<td>Emotions in Context</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integration</td>
<td>Chair: Tanja Michael, Department of Clinical Psychology and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chair: Silvia H. Koller, Department of Psychology,</td>
<td>Psychotherapy, Universität des Saarlandes, Germany</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Universidade Federal do Rio Grande do Sul, Brazil</td>
<td>Ralph Adolphs, Division of the Humanities and Social Sciences,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taciano L. Milfont, School of Psychology, Victoria</td>
<td>California Institute of Technology, USA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University of Wellington, New Zealand</td>
<td>Iris M. Engelhard, Department of Psychology, Utrecht University,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frosso Motti-Stefanidi, Department of Psychology,</td>
<td>The Netherlands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>National and Kapodistrian University of Athens, Greece</td>
<td>Jeanne L. Tsai, Department of Psychology, Stanford University,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stacey Sinclair, Department of Psychology, Princeton</td>
<td>Frank H. Wilhelm, Department of Clinical Psychology and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University, USA</td>
<td>Psychotherapy, University of Salzburg, Austria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alan Teo, Department of Psychiatry and School of Public</td>
<td>Klaus R. Scherer, Department of Psychology, University of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health &amp; Science University, USA</td>
<td>Geneva, Switzerland (Discussant)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bridging the Lab and the Real World</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chair: Gabriella Vigliocco, College London, United</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kingdom</td>
<td>Karen E. Adolph, Department of Psychology, New York University,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Better Minds: Understanding Cognitive Enhancement</td>
<td>Emiliano Macaluso, Impact Team, Lyon Neuroscience Research</td>
<td>Marco Iacoboni, Department of Psychiatry and Biobehavioral</td>
<td></td>
</tr>
<tr>
<td>Chair: Lorenza S. Colzato, Department of Psychology,</td>
<td>Center, France</td>
<td>Sciences, University of California, Los Angeles, USA</td>
<td></td>
</tr>
<tr>
<td>Cognitive Psychology Unit, Leiden University, The</td>
<td></td>
<td>Andrzej Nowak, Department of Psychology, University of Warsaw,</td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td></td>
<td>Poland and Florida Atlantic University, USA</td>
<td></td>
</tr>
<tr>
<td>Daphne Bavelier, Department of Psychology, University of</td>
<td></td>
<td>Natalie Sebanz, Department of Cognitive Science, Central</td>
<td></td>
</tr>
<tr>
<td>Geneva, Switzerland</td>
<td></td>
<td>European University, Hungary</td>
<td></td>
</tr>
<tr>
<td>Arthur F. Kramer, Department of Psychology, Northeastern</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University, USA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. Glenn Schellenberg, Department of Psychology,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University of Toronto, Canada</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ilina Singh, Department of Psychiatry University of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxford, United Kingdom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ilina Singh, Department of Psychiatry University of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxford, United Kingdom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ilina Singh, Department of Psychiatry University of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxford, United Kingdom</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**KEYNOTE SPEAKERS**

- Linda B. Smith, Indiana University Bloomington, USA
  - How Infants Break Into Language

- Thomas Bourgeron, Pasteur Institute, France
  - Diversity in Autism

- W. Tecumseh Fitch, University of Oxford, United Kingdom
  - People Are Animals Too

- Scott Atran, School of Anthropology and Museum Ethnography, University of Oxford, United Kingdom
  - In Sync: The Dynamics of Social Coordination

- Natalie Sebanz, Department of Cognitive Science, Central European University, Hungary
  - Diversity in Autism

---

**ICPS 2017**

- [Register Today](https://www.icps2017.org)
  - [www.icps2017.org](https://www.icps2017.org)
  - [www.dpc-software.de](https://www.dpc-software.de)
  - [Dittrich & Partner](https://www.dittrich-partner.de)

**#icps17vie**
FEATURES

This is R Time
A collection of articles shows how use of the programming language R for statistical computing and graphics is improving reproducibility.

18 Why You Should Become a UseR
By Sara J. Weston and Debbie Yee

20 Equivalence Testing With TOSTER
By Daniel Lakens

22 YaRrr! The Pirate’s Guide to R
By Nathaniel D. Phillips

24 Finding Bootstrap Confidence Intervals for Effect Sizes With BootES
By Kris N. Kirby and Daniel Gerlanc

27 BayesMed and statcheck
By Michèle B. Nuijten

Presidential Column
Preparing Students for Diverse Careers in Our Science
Guest Columnist and APS Fellow Sian L. Beilock discusses an initiative to teach PhD students about the value that their skills can have beyond academia.

Data on Display
A team of scientists details the use of graphical descriptives to improve research transparency.
Contents (cont.)

Departments

Observations 8
Student Notebook 35
Members in the News 38
Announcements 41

Assocation for Psychological Science

Teaching Current Directions in Psychological Science

Featured article: “Why Teach Methods?”

EARLY PRICE REGISTRATION THROUGH APRIL 5

CROSS-CUTTING THEMES

The Many Flavors of Relationships

The Science of Fear: From Basic Psychological Mechanisms to Impact on Society

Doing the Most for the Many: Psychological Scientists Who Inform Public Policies

29th Annual Convention

ASSOCIATION FOR PSYCHOLOGICAL SCIENCE

www.psychologicalscience.org/convention
Preparing Students for Diverse Careers in Our Science

Psychological science shares borders with many diverse areas. Training in psychological science thus can prepare students to succeed not only in academic departments related to psychology, but also in nonacademic worlds. I asked my colleague Sian L. Beilock to describe the initiative that she is spearheading at the University of Chicago — UChicagoGRAD — which is dedicated to teaching PhD students, including students of psychological science, about the value that their skills can have beyond academia. Beilock has written several pieces on graduate education, which she drew on in writing this column.

-APS President Susan Goldin-Meadow

What do you see yourself doing after you finish your PhD? is a question I always ask prospective PhD students during their recruitment visits to the University of Chicago. For several years, I accepted only one answer — that a prospective student aspired to be a professor at a research university. These days, my thinking about the types of answers that are appropriate has expanded.

It’s not just because I am now aware that the number of psychology PhDs awarded in a given year outstrips available tenure-track jobs by a large margin, but also because I have come to recognize that some of the best students are interested in diverse career paths. Students are motivated by many desires, ranging from making a clear and immediate impact in the world to — dare I say it — maximizing their earning potential, and a career in academia is not the only option.

The varied career aspirations of students, however, present some faculty with a problem. Most of us are quite good at helping our students emulate the path we took toward a faculty position, but we have little experience navigating a career outside the ivory tower and are unprepared to advise students who want to move in a different direction. What do we do?

Three years ago, I stepped into an administrative role at The University of Chicago, and I am now the Executive Vice Provost of the university. As part of my portfolio, I worked with academic leaders to develop a new office and initiative called UChicagoGRAD (Beilock, 2015; 2016a, 2016b). UChicagoGRAD is committed to ensuring that graduate students and postdocs have the skills they need to become the next generation of leaders — both inside and outside the academy. Our philosophy is based on a simple premise that I would argue holds true for psychology as well as for many other fields: Many of the same skills are needed for students to be successful in the academy, industry, nonprofits, and government. It is important to be an effective writer, communicator, researcher, critical thinker, teacher, and team member, whether you end up in the classroom or the boardroom.

With these ideas in mind, UChicagoGRAD works with graduate students and postdocs to help them develop and demonstrate a varied skill set and then to connect them with the job opportunities they want. Crucially, many of our activities can be implemented at the department level, or even at the individual faculty level, to help psychology students become leaders in whatever careers they pursue.

Take a series UChicagoGRAD puts on called “Expose Yourself!” It is an interdisciplinary series of programs that gives graduate students and postdocs the opportunity to practice presenting their academic work to non-specialists from across the university. Hundreds of students have, for example, gone on “lab crawls” — moving through four to five labs in an evening — in which students from each lab give short, 10-minute talks on their research-in-progress. The key
March 2017 — Vol. 30, No. 3

is to have folks with a variety of backgrounds attend so that students are tasked with discussing the significance of their work to broad audiences. As I have told my PhD students on countless occasions, their goal in interviews for assistant professorships is not to convince the person whose work is most related to their own that they should get the job. This person likely wants to hire them already. Their job is to connect with the person whose work is farthest afield from their own. Activities like our “Expose Yourself!” series help students learn to speak “jargon free”; relate to other people’s interests, background, and priorities; and adjust their presentations accordingly. As a result, they possess the ability to communicate in a way that will not only help them pursue careers as assistant professors, but also as psychological scientists in industry, government, or the nonprofit sector.

We also have started an internship and externship program for graduate students to explore diverse careers while gaining professional experience related to their research interests. These experiences range from 1 day to an entire summer. For example, this past summer one of my PhD students, whose research program focuses on understanding individual differences in executive function, attentional control, and human skill learning, spent 3 months in northern California as a paid intern performing research for Sony. In a video-game research lab, he used his knowledge of how we attend and learn to help develop action video games. His experience at Sony, in turn, helped further his dissertation research on learning and performance in real-world, high-pressure situations.

Alumni engagement has been key to the success of our career exploration and development programming. Bringing together students and postdocs with alumni who have taken a variety of career paths benefits the professional exploration process while at the same time strengthening the connection between alumni and university.

The creativity, logic, and persistence that go into obtaining a doctoral degree in psychology and related fields prepare people to be powerful members of society and the workforce, including (but certainly not limited to) the academy. Obtaining a psychology PhD can be excellent preparation for research-based jobs across industries — from advertising and market research to consulting, recruiting, positions in government and private foundations, and a wide range of other types of businesses. Even if we as faculty members don’t have direct experience pursuing diverse careers, we owe our students the kind of flexible training that will serve them well in and out of the academy and will prepare them to advocate for the value of their skills, which are likely deeply relevant for any career they choose.  

References


Beilock Receives National Academy of Sciences Troland Research Award

The National Academy of Sciences has announced that APS Fellow Sian L. Beilock is a recipient of the 2017 Troland Research Award. The $75,000 prize is awarded to young investigators in recognition of outstanding scientific achievement within experimental psychology.

Beilock, the Stella M. Rowley Professor of Psychology and an Executive Vice Provost at the University of Chicago, primarily conducts research on performance, anxiety, and why people “choke” under pressure. More specifically, her research examines how high-stress situations influence underlying psychological, physical, and neurological mechanisms to compromise performance, even in highly skilled individuals. As Beilock and her colleagues have demonstrated, anxiety itself can interfere with our ability to learn and execute complex skills, depriving people of the cognitive resources they need to excel.

From school math tests to professional sports, these findings have tremendous cross-cutting implications that affect people from every walk of life. In addition to demonstrating the very real effects of anxiety on performance, Beilock also is pursuing solutions to help people overcome the negative effects of performance anxiety.

For example, Beilock and colleagues have found that the more anxiety children have about math, the worse their performance. But these math-anxious children are not performing poorly simply because they are intrinsically bad at math. In a cutting-edge study, Beilock and colleagues have developed an interactive app to help parents and kids learn about math together as a positive activity. Their results showed that using the app just once a week led to significant positive outcomes on math learning.

In 2011, Beilock received the APS Janet Taylor Spence Award for Transformative Early Career Contributions. Her groundbreaking work on performance anxiety has resulted in the publication of more than 100 scientific papers and two critically acclaimed books, Choke: What the Secrets of the Brain Reveal About Getting It Right When You Have To and How the Body Knows Its Mind: The Surprising Power of the Physical Environment to Influence How You Think and Feel.
Help students master the art of scholarly writing.

APA Style CENTRAL® provides students with expertly created resources and authoritative guidance on how to think and write like scholars. A complete online environment rooted in APA Style®, this campus-wide solution includes a state-of-the-art writing tool along with a host of APA publications, tutorials, samples, and reference forms that help guide and inform the writing and research processes. In addition, APA Style CENTRAL equips instructors with a vast collection of pedagogical tools to aid student development, monitor their progress, and enhance scholarly writing and research across many disciplines.

To find out more about how your institution can start a free 30-day trial, contact an APA Representative by phone: 877-236-2941 or email: apastylecentral@apa.org.

www.apastyle.org/aps
Justice Department Turns to Psychological Science to Improve Eyewitness Testimony

The US Department of Justice (DOJ) is tapping into psychological science — including recommendations from a forthcoming report in *Psychological Science in the Public Interest (PSPI)* — to develop new guidelines for eyewitness identification procedures.

Drawing on decades of scientific research, a team of experts — including prosecutors, law enforcement personnel, and psychological scientists — worked together to identify best practices in conducting eyewitness identifications.

The best practices recommendations set forth in the DOJ memo draw considerably on research conducted by APS Fellow John T. Wixted (University of California, San Diego) and APS James McKeen Cattell Fellow Gary L. Wells (Iowa State University), including the forthcoming *Psychological Science in the Public Interest (PSPI)* report that the two scientists have coauthored.

Among various recommendations, the memo highlights the importance of assessing eyewitness confidence at the time the eyewitness makes his or her initial identification. Referencing the PSPI, the memo states that “new research finds that a witness’s confidence at the time of an initial identification is a reliable indicator of accuracy.”

As Wixted and Wells note, converging evidence indicates that when eyewitnesses make an initial identification with high confidence under specific, so-called “pristine,” conditions, confidence is a reliable indicator of accuracy. Even more importantly, when eyewitnesses express low confidence in their initial identification, that identification is prone to error, regardless of the conditions under which they make the identification.

A preprint of the PSPI report is now available online at bit.ly/2jup5E4 — the complete report, including accompanying commentaries, will be published online later this year.

As law enforcement and legal communities in the United States increasingly draw on psychological science to inform certain procedures and guidelines, researchers are working to promote similar evidence-based practices in the United Kingdom. A recent roundtable organized by psychological scientist Laura B. Mickes (Royal Holloway, University of London, United Kingdom) brought together researchers and practitioners to discuss how science-based practices can yield more reliable convictions and better outcomes for victims and eyewitnesses. Wixted presented findings from the PSPI at that event.

APS Fellow Gary L. Wells will speak at the 2017 APS Annual Convention, May 25–28, 2017, in Boston, Massachusetts.
FRED KAVLI KEYNOTE ADDRESS
Only When the Shoe Fits: Primitive Procedures for Vocabulary Learning
Lila R. Gleitman
University of Pennsylvania

BRING THE FAMILY ADDRESS
What Makes the Human Mind Special? Insights From Nonhuman Animals
Laurie R. Santos
Yale University

PRESIDENTIAL SYMPOSIUM
Sense and Sensibility: How Our Bodies Do — and Don’t — Shape Our Minds
Susan Goldin-Meadow (Chair)
The University of Chicago

How Our Bodies Shape How We See
Jessica K. Witt
Colorado State University

Evaluating the Research on Postural Feedback: Strong Evidence That Expansive Posture Affects Feelings, Mixed Evidence That It Affects Behavior and Hormones
Amy J.C. Cuddy
Harvard University

How Our Hands Help Us Learn: The Role of Gesture in Cognitive Change
Susan Wagner Cook
The University of Iowa

The Emergence of American Sign Language From Depiction and Embodiment
Ted Supalla
Georgetown University

SPECIAL EVENTS
Real-World Implications of Implicit Bias
Michelle N. Shiota (Co-Chair)
Arizona State University, Tempe

Elizabeth Page-Gould (Co-Chair)
University of Toronto, Canada

Modupe N. Akinola
Columbia University

Louis A. Penner
Wayne State University/

Naomi Ellemers
Utrecht University, The Netherlands

APS-DAVID MYERS DISTINGUISHED LECTURE ON THE SCIENCE AND CRAFT OF TEACHING PSYCHOLOGICAL SCIENCE
Harnessing the Ingenuity of Students
Michelle “Mikki” R. Hebl
Rice University

Lila R. Gleitman will be featured in the Inside the Psychologist’s Studio program at this year’s convention. She will be interviewed by APS President Susan Goldin-Meadow.
When a 'Golden Opportunity' to Bribe Arises, It's Hard to Pass Up

The path to corrupt behavior may sometimes be a steep cliff instead of a slippery slope, according to new findings in Psychological Science. In four studies, psychology researchers find that people are more likely to engage in bribery if it occurs as a sudden opportunity rather than as the result of a gradual process.

"Unethical behavior like corruption does not always emerge gradually but sometimes occurs abruptly, spontaneously, and unexpectedly," explains lead researcher Nils C. Köbis of VU Amsterdam, the Netherlands. "Especially when the decisions appear in rapid succession, people might be reluctant to engage in corruption repeatedly and rather want to reap the benefits of larger forms of corruption in a single act."

The popular idea that unethical behavior tends to start small and build up over time falls in line with established psychological processes like moral disengagement and shifting social norms — the gradual progression from small, ambiguous acts to progressively larger transgressions may enable those involved to maintain the belief that they are moral, upstanding people.

But Köbis and VU colleagues Jan-Willem van Prooijen, Francesca Righetti, and APS Fellow Paul A. M. Van Lange wondered whether corrupt behavior might also emerge when people encounter what appears to be a "golden opportunity" — a unique circumstance that stands to convey large and immediate benefits and seems too good to pass up.

Corrupt behavior that happens once, in response to a sudden opportunity, may be easier to rationalize than repeated unethical behaviors, the researchers hypothesized.

Köbis and colleagues decided to put the two possible mechanisms to the test in a series of four studies.

In the first study, 86 student participants played a competitive game with five rounds. In each round, two competing players adopted the role of CEO of a construction company with a budget of $50,000 each to make bids for a contract worth $120,000. A third player, the public official, awarded the contract to the highest bidder. If the bids were equal, the players split the award down the middle. In reality, only one of the competing players was actually a participant — the other competitor and the public official were represented by a computer program.

Importantly, the game was stacked such that participants had the opportunity to bribe the public official. In some cases, players were presented with a steep-cliff option: They could invite the public official to a banquet, which ensured their advantage in a quarter of the subsequent bidding rounds, and they could later increase this advantage to 100% by inviting the official on vacation. The overall cost of both options was the same — only the path toward severe corruption differed.

The resulting data showed that people were much more likely to bribe when they were given the abrupt steep-cliff option than when they were given the gradual slippery-slope option.

Köbis and colleagues saw the same pattern of results in a second study that included a third bribery condition in which the second corrupt act was less severe than the first.

To ensure that the game held some real-world incentives for the participants, the researchers conducted a third study in which players earned actual money in proportion to their winning bids. Again, people were much more likely to use the option to bribe the official when the bribe was immediate and severe than when the bribe was gradual.

A fourth study, with all players represented by participants and greater monetary incentives, showed similar results.

Importantly, participants in all four studies acknowledged the moral transgression involved in bribery. Participants consistently rated severe bribery as less moral than mild bribery and no bribery.

Together, these four studies indicate that severe unethical behavior doesn't necessarily emerge through a gradual process but can result from a sudden "golden opportunity." Although research examining the psychological mechanisms that drive corrupt behavior is still in its infancy, these findings and future work stand to provide important insight into a very real and consequential issue.

"Given that corruption has immense negative effects for society, in each country around the world, research that helps to understand when and how people engage in corruption can potentially yield crucial societal benefits," says Köbis. "With the help of more research on this topic and by enabling an exchange between practitioners and academics, in the future such situations could be identified and preventive measures could be designed."

Köbis is supported by a Research Talent Grant from the Netherlands Organisation for Scientific Research (Grant No. 406-12-003). This article has received badges for Open Data and Open Materials.

Reference

"The results of the first set of Replication Studies are mixed, and while it is too early to draw any conclusions, it is clear that assessing reproducibility in cancer biology is going to be as complex as it was in a similar project in psychology."

--APS Fellow Brian Nosek and microbiologist Timothy M. Errington, Center for Open Science, from eLife, on an ongoing initiative to replicate findings from nearly 30 major cancer biology studies. Full results from that initiative are due by the end of 2017.
Markus, Schacter, Sternberg to Receive William James Fellow Award at APS Annual Convention

Hazel R. Markus (Stanford University), Daniel L. Schacter (Harvard University), and Robert J. Sternberg (Cornell University) will receive the APS William James Fellow Award — recognizing their lifetime of intellectual contributions to the basic science of psychology — at the 2017 APS Annual Convention, May 25–28, in Boston. All three will deliver award addresses at the convention.

Markus, an APS Fellow, is known for her seminal work examining how people think about the self. Her research has shown how our self-schemas affect our motivations, achievements, and actions. Markus’s pioneering investigations at the intersection of self and culture helped to lay the foundation for the now-burgeoning field of cultural psychology. She is the Director of Stanford’s Research Center for Comparative Studies in Race and Ethnicity, which encourages multidisciplinary research and diversity in the field of psychological science. In her award address, Markus will discuss how promoting interdependence can bridge cultural divides and also enhance individual motivation and performance.

Schacter’s groundbreaking discoveries about how memory works — and how it fails — have cast new light on the constructive nature of memory. Schacter, an APS Fellow, has demonstrated that memory works as a “virtual reality simulator,” drawing on past events as a way of imagining the future and employing the same cognitive and neural networks for both tasks. Schacter’s priming experiments and case studies span 35 years of exploration, yielding deep insights into a complex human capacity. Schacter has titled his award address “Adaptive Constructive Processes in Memory and Imagination.”

Sternberg, an APS James McKeen Cattell Fellow, is known for his triarchic theory of intelligence, which posits that there are three distinct facets of intelligence: analytic, creative, and practical. This theory has propelled the study of intelligence toward an increasingly cognitive-based approach, prompting the development of a concept Sternberg calls “successful intelligence.” This concept suggests that intelligence extends beyond academic prowess to real-world problem solving and goal-oriented behavior. His award address is titled “Are We Creating a Society of Smart Fools? Lessons From 40+ Years of Research on Human Intelligence, Creativity, and Wisdom.”

In addition to award presentations given by this year’s awardees, there will be a symposium in honor of APS Past President Mahzarin R. Banaji (Harvard University), who received the APS William James Award in 2016 but was unable to attend that year’s APS Annual Convention.

APS Fellow Hazel R. Markus will speak at the International Convention of Psychological Science, March 23–25, 2017, in Vienna, Austria.

COMING SOON!

A unique new journal from APS …

Advances in Methodologies and Practices in Psychological Science

Advances in Methodologies and Practices in Psychological Science will publish empirical work along with articles and tutorials on research practices, methods, and conduct. An explicit part of the journal’s mission is to encourage integration of methodological and analytical questions across multiple branches of psychological science.

Watch for submission information later this spring!

See information on APS Registered Replication Reports and apply to participate here:
www.psychologicalscience.org/replication
The Editors’ Corner: Conducting and Publishing Integrative Science

In this ICPS Special Event, editors of leading psychological science journals share their unique perspectives on integrative science. Topics of discussion include where integrative science fits into the mission of psychological journals, barriers to publishing integrative work, guidance for early-career researchers, and future directions of integrative research.

D. Stephen Lindsay (Psychological Science), Department of Psychology, University of Victoria, Canada
Barbara L. Finlay (Behavioral and Brain Sciences), Department of Psychology, Cornell University, USA
Rebecca Schwarzlose (Trends in Cognitive Sciences), Cell Press, USA
Randall W. Engle (Current Directions in Psychological Science), School of Psychology, Georgia Institute of Technology, USA

www.icps2017.org
Research on Baboons’ Capacity for Speech Sounds Makes International Splash

Nonhuman primates can do a lot of things that humans do — they can use tools, teach each other skills, and use sound to communicate. But they don’t seem to be capable of making human-like speech sounds — or so researchers thought. A team of scientists including APS Fellow Arnaud Rey (Centre National de la Recherche Scientifique and Aix-Marseille University, France) has just published new findings showing that Guinea baboons do, in fact, make sounds akin to human vowel sounds.

Researchers had long thought that primates were not capable of making human-speech-like vocalizations due to the high position of their larynx. But this explanation doesn’t hold true in light of the fact that human infants also start out with high larynxes and are able to make these speech sounds.

The research team analyzed 1,404 recordings from 15 Guinea baboons native to West Africa but living in a primate center in France. The team found that the baboons produced at least five sounds that are very similar to vowel sounds found in many human languages. And, like humans, the baboons also stuck sounds together to produce vocalizations, such as “wahoo calls,” in an additive process that was thought to be unique to humans.

“We were surprised that the baboons combined the vowel-like sounds in various ways,” first author Louis-Jean Boë said in a PLOS ONE news story about the research.

The work has generated international media attention, featured in stories from the New York Times (United States), National Post (Canada), BBC (United Kingdom), Le Parisien (France), La Vanguardia (Spain), Die Welt (Germany), Kurier (Austria), and other news outlets.

This new evidence of primates’ vocal abilities supports previous research from cognitive scientist W. Tecumseh Fitch (University of Vienna, Austria) and colleagues that suggests Japanese macaques have the anatomy required to be able to produce speech.

“It perfectly complements our own results,” Fitch said in an interview with Science. And it “provides additional evidence that scientists have underestimated the flexibility of the primate vocal tract.”

Fitch is a keynote speaker at the International Convention of Psychological Science taking place March 23–25 in Vienna, Austria. His address, “Cognitive Evolution: People Are Animals Too,” will explore how cross-species evolutionary research shows just how much humans have in common with other animals and helps shed light on the evolution of cognition over time.

Reference
A number of psychological scientists are engaged in the US government’s efforts to improve public programs and policies. The Office of Evaluation Sciences (OES) in the General Services Administration is one of the leaders of this effort.

APS talked recently with Crystal C. Hall, an OES Fellow who is a psychological scientist and Associate Professor at the Evans School of Public Policy & Governance at the University of Washington. Hall’s research examines decision-making in the context of poverty.

**APS: Can you tell us more about what the Office of Evaluation Sciences is and some of the recent projects that OES has been involved in?**

**CH:** Our main goal is to help agencies within the federal government apply insights from psychological science and other behavioral sciences to the way they are designing and implementing their programs. We’re a group of applied behavioral scientists from a variety of backgrounds, and we connect with agencies to help them think about potential improvements to their programs. Typically, we use data and metrics that are already being captured as a way of measuring the success of our improvement attempts.

**APS: Have groups and agencies been receptive to working with OES?**

**CH:** Yes, they have been very receptive and, in fact, OES receives many more requests for collaboration than the team can pursue. I think, over time, federal agencies have become even more invested in measuring outcomes, and OES has built a reputation within the government where agencies really do appreciate this new lens we can bring to the work that they do, and to understand that we’re really there, first and foremost, to serve them and help them work more effectively.

**APS: Are there any particular projects you’d like to highlight?**

**CH:** In a recent report, we described work we conducted in eight different areas. One of the areas is advancing economic opportunity and thinking about how we improve the way that families access different types of programs and services. Going into the next year, we are increasing our focus on projects and agencies that have outcomes tied to economic opportunity and health.

We’ve been doing some ongoing work looking at helping low-income kids get access to free or reduced-price meals.

We’ve worked with the National School Lunch Program, which is part of the Department of Agriculture, to improve the processes by which people apply to this service to try to expand enrollment, so that we can improve the number of kids that have access to meals.

And then on the other side of the spectrum in terms of economic opportunity, we’ve also looked at improving the way that small family farmers access credit, through some targeted outreach to help farmers understand the process by which they can apply for these microloans.

With both of these projects, like many of our projects, we looked at the kind of mechanisms by which individuals interact with the program and thought about how we can incorporate tools from behavioral science to improve that process, whether it’s by simplifying or automating an application process, making changes that make it easier for an individual to submit an application, or communicating with individuals about a program in a way that is more effective.

**APS: Can you tell us about your personal story and how you started working with OES?**

**CH:** I’d previously done some work with some state governments and the federal government on similar types of projects, coming in as the psychological scientist and engaging to help use the insights from our field to think about how to improve programs. It seemed like a natural next step to do more work with the federal government. I was connected with some members of the team by other colleagues, and, fortunately, the timing was right for me to spend a year in DC. I’ve completed my full year, but continue to engage part-time project and strategic work as OES continues its work.

**APS: Do you have any advice for what psychologists should do if they’re interested in getting involved in research with local governance or state or federal governments?**

**CH:** For me, the work started by finding connections in my...
home institution. One of the benefits that I had to get into this type of work a little bit more easily is that I am housed in a public policy school, so there are many natural connections that I can make with individuals that are doing on-the-ground work. Psychological scientists who are doing mainly academic work can find people at their institutions that are connected with people out in the real world. That was the first step for me, and it started very small, with very small projects, but then I was able to get experience and the novel set of skills you need for this kind of work.

**APS: What are some of those skills that are necessary for success?**

**CH:** I think the most important one — on top of the typical skills you need to be a good experimental psychologist — is the ability to communicate effectively. Our agency partners come from diverse backgrounds in terms of their experience with experimental research. Very often, we’re in a position where we really need to explain our work and the basics of research design to partners without prior experience in this area. Being able to work through the logistics of details such as experiment design, sample size calculations, or data analysis with someone in an agency is crucial, because if you’re not able to be effective in terms of the communication piece, it’s hard to get very far.

**APS: What are psychological science uniquely have to offer to solve these challenges?**

**CH:** Psychological scientists have a unique lens to help us understand what happens in between some individual touchpoints for a policy or program and the ultimate outcome. In the policy world, often we implement a policy, look at the outcomes, and use that to evaluate how effective the policy was. Psychological scientists have a set of skills that helps us think about why this process might not always be as straightforward as we expect it to be.

**APS: Is there anything else you’d like our readers to know?**

**CH:** I think it’s a really exciting time to be a psychological scientist that has an interest in applied behavioral science, and I think there are more and more opportunities coming for folks to do this type of work. There’s lots of these kinds of little units setting up in different cities and states around the country. There’s still a lot of work that we have to offer, so I look forward to seeing more and more of this research coming out.

Readers interested in learning more about some of OES’s recent projects can read coverage in the APS Observer magazine by visiting www.psychologicalscience.org/r/citizens and www.psychologicalscience.org/r/government.

---

**Scientists Respond to US Travel Ban Order**

Hundreds of scientists around the world — including at least 25 psychological and behavioral researchers — have offered space in their facilities for US-based researchers who face the possibility of being affected by immigration and visa restrictions.

Please visit [http://bit.ly/2kbvA0t](http://bit.ly/2kbvA0t) for updates about this developing story.

---

**AT RANDOM**

“You can imagine that a rational person would look at a cash discount, understand that it’s functionally the same as a credit card surcharge, and make his decision accordingly. But the cool and important contribution that behavioral science can make here is to highlight how people behave in reality, which is not in this so-called rational way. The word ‘surcharge’ prompts consumers to think about the price differential in a way that ‘discount’ does not — which, in turn, has an effect on their willingness to use cash.”

–Todd Rogers, Harvard University, on a US Supreme Court case regarding whether laws about credit card surcharges violate free speech rights, on FiveThirtyEight.com. Rogers and colleagues conducted an experiment to test the effects of surcharges and included the results in an amicus brief to the Supreme Court. From fivethirtyeight.com.
This month brings the annual US college basketball tournament known as March Madness. And every March, the Observer borrows that theme to spotlight innovations and trends in research practices and methods.
This Is R time

In Ancient Rome, the letter R was known as the “dog’s letter” (littera canīna) because the sound was reminiscent of a dog’s growl. Among modern scientists, the letter R has become synonymous with exciting developments in statistical analysis and data visualization. R is a free, open-source programming language that is revolutionizing the way psychological scientists conduct research.

Initially written in 1991 by two statistics professors, Ross Ihaka and Robert Gentleman (the two Rs behind the name R) of the University of Auckland, New Zealand, the programming language R was developed to make it easier for scientists to organize, analyze, and distribute data. R can be used for many of the same functions as commercial software, such as SPSS or SAS, but it has the added advantages of being free and having an incredibly active community of users who are constantly coming up with new features and “packages.” Anyone can write up a new function and save it as an R package in the Comprehensive R Archive Network (CRAN) repository. With more than 1 million users worldwide and more than 10,000 packages, R is emerging as a popular tool for scientists of all stripes — including social and behavioral scientists.

Psychological scientists from around the globe are writing their own R packages that are being used to enhance a wide range of methodological practices, from running sophisticated statistical analyses to improving the reproducibility of research.

For an extensive list of resources, visit www.psychologicalscience.org/r/resources.
Why You Should Become a UseR

A Brief Introduction to R

By Sara J. Weston and Debbie Yee

If you are reading this article, you’ve likely heard of the programming language R but may be avoiding it. R is a programming language for statistical computing and graphics that you can use to clean, analyze, and graph your data. It is widely used by researchers from diverse disciplines to estimate and display results and by teachers of statistics and research methods. It’s free, making it an attractive option, but does rely on programming code — instead of drop down menus or buttons — to get the job done. Programming languages can be intimidating. Maybe you like the comfort and familiarity of whatever statistics program you’ve been working with. Maybe you don’t have the time to learn a new skill. Maybe you just don’t know where to start. These are all valid reasons for putting off using R. But we use R for research and teaching, and we believe that the benefits far outweigh the time and effort needed to start. We are here not only to convince you to use R, but to provide you with some resources to do so.

Reasons to become a useR

One of the most powerful characteristics of R is that it is open-source, meaning anyone can access the underlying code used to run the program and add their own code for free. This means that R:

1. will always be able to perform the newest statistical analyses as soon as anyone thinks of them;
2. will fix its bugs quickly and transparently; and
3. has brought together a community of programming and stats nerds (a.k.a., useRs) that you can turn to for help.

Anyone can write their own R code, which means anyone can add to the huge list of R’s tools. Programmers submit their code to R in the form of “packages.” Some packages specialize in specific kinds of analyses, while other packages are much broader. For example, the “pwr” package by Stephane Champely specializes in conducting power analyses. In contrast, the “psych” package by APS Fellow William R. Revelle can do anything from descriptive statistics to item-response theory to mediation analyses. At the start of 2017, there are just under 10,000 packages available. And as soon as a new statistical approach is developed, someone will create a new package or add new tools to an existing package.

Moreover, anyone can look at the code used in a package. And there are lots of useRs who know what they’re doing and can recognize programming bugs when they appear. Package authors will tell you that their email inboxes are flooded with emails from fellow R aficionados who have come across errors in their code. This means that bugs are found quickly and fixed quickly. As a useR, you don’t need to wait a year for a new version of a package to be released; new updates are available as soon as authors makes changes to their packages. And those updates are published, making the entire process transparent.

This dynamic between typical useRs who want to examine data and package authors who want to make new techniques available is incredibly collaborative — so much so that R users find themselves entering a community of researchers and programmers. For some, this interaction is limited to asking for help (it’s often as simple as Googling your question). For those who believe their soul mate is another useR (there are many of us), there are meetup groups around the country and entire conferences organized around R.

Now the question remains: What should you use R for? Everything. No seriously, everything. Toss out SPSS, SAS, and STATA, because R can do all the descriptive analyses, regression equations, (M)AN(C)OVA, and hierarchical linear modeling you want. No need to buy MPlus, because R has structural equation modeling covered. Don’t bother opening Excel, because merging data sets, cleaning data, identifying important rows or columns, and even updating your gradebook can be done in R. Save money on colored pencils, because R will create whatever plot or graphic you can imagine, even if it’s 3D or interactive or both. R can be used with text processors like LaTeX, so you can integrate your results right into the manuscript itself. Stuck using Microsoft Word because your collaborators like track changes? R will create APA formatted tables, complete with significance stars and horizontal lines and export them as .doc files for your convenience. R can do both frequentist and Bayesian statistics. R can make use of your multi-core processor and run analyses in parallel. Search for a “bit of fun with R” and learn how to make a winking elephant. R can bootstrap, simulate, randomize, resample, multiply, impute, and park your car. Well, R can’t park your car — yet.

On a global scale, R can address many of the challenges of performing reproducible research. A particular study may fail to replicate for a variety of reasons, but one of the simplest being that we often forget exactly what we did to our data to get our results. How did you create scores from your items — averaging, summing, reverse-scoring, or item-response theory? Did you center
variable two? Which participants did you exclude and based on what criteria? We often come back to our own data and say, “Wait, what did I do here?” R can remedy these issues because you’re using scripting to perform your analyses. Scripting means you write code, which is later run to manipulate data, perform analyses, and make graphics. In other words, using R involves writing a document that contains everything you did, in the order you did it, as you analyze your data. Theoretically, you can share your code and data with literally anyone in the world, and they can use that code and that data to reproduce your results, statistics, and plots with no extra work or thought on their part. This ability to share your analyses has been augmented by online databases like the Open Science Framework in which you can publicly share your analysis scripts and data from your research projects.

A final reason you should become a user is that R is increasingly being used as an industry standard in the realm of data analytics, also known as “data science.” Many companies (e.g., Facebook, Merck, Pfizer) that hire psychology PhD students recruit candidates who have a solid grasp of both statistics and programming. Learning R will make you a more attractive candidate if you apply for nonacademic jobs, and teaching R will provide your students with more career options.

How to actually become a user

By now you may be thinking, “R sounds great, but I have absolutely no programming experience. How do I even get started with R?” Never fear! Here, we provide some concrete launching points to start your trajectory toward becoming an expert user:

Install R and RStudio. The first step of become a user is installing the correct software onto your computer. In the old days (technically before 2012), the learning curve for R was incredibly steep because the only graphical window that you could interface with was a large empty white console — the kind of blank slate that fills any psychologist’s heart with trepidation. Some really great engineers decided that this was terribly inefficient and developed a graphical user interface (GUI) called RStudio. This made R more user-friendly for individuals without a programming background. We strongly recommend that you install RStudio in addition to R, as it will make your life exponentially easier.

Learn the basics. There are some great tutorials that are freely available online and are great introductory tools for getting you started on your journey to R mastery. We have searched far and wide (across the Internet), and have identified a handful of useful resources, such as “Learning Statistics with R” by Dan Navarro and “YaRrr: A Pirate’s Guide to R” by Nathaniel D. Phillips (for full story, see p. 22). You can even learn R with accompanying cat GIFs. All of these tutorials appear in our extensive list of R Resources, available online at www.psychologicalscience.org/r/resources.

Explore the advanced techniques. At this point, your uses for R will depend on your research program and your own teaching needs. In our resources list, we’ve pointed to some packages that we like to use on a regular basis, and we have included some packages that are useful for advanced statistical and graphing techniques. Start exploring those, dipping into topics and tools that sound interesting to you. After a while, you’ll come across new packages on your own. Keep an eye on the R-Bloggers.com website to stay on top of new trends (e.g., the new fivethirtyeight package released by Andrew Flowers, the quantitative editor of FiveThirtyEight.com). The more you use R, the more you will get out of it. Furthermore, if you become savvy enough with the R language yourself, you can even write your own functions and packages and distribute them to the public for general use.

We hope that this brief introduction has provided you with the tools and momentum to get started using R for your analyses. R is an incredibly flexible and complex research tool, but once you have mastered it, you can do (almost) anything.

Equivalence Testing With TOST

By Daniel Lakens

A ny science that wants to be taken seriously needs to be able to provide support for the null hypothesis. I often see people switching over from frequentist statistics when effects are significant to the use of Bayes factors to be able to provide support for the null hypothesis. But it is possible to test if there is a lack of an effect using p values. (Why no one ever told me this in the 11 years I worked in science is beyond me). It’s as easy as doing a t test, or, more precisely, as doing two t tests.

I’ve created my first R package, TOSTER (as in Two One-Sided Tests for Equivalence in R). Don’t worry, there is also an old-fashioned spreadsheet available as well (see “TOSTER Materials,” p. 21).

Sometimes you perform a study where you might expect the effect to be zero or very small. So how can we conclude an effect is “zero or very small”?

One approach is to specify effect sizes we consider “not small.” For example, we might decide that effects larger than \( d = 0.3 \) (or smaller than \( d = -0.3 \) in a two-sided t test) are “not small.” Now, if we observe an effect that falls between the two equivalence bounds of \( d = -0.3 \) and \( d = 0.3 \), we can act (in the good old-fashioned Neyman–Pearson approach to statistical inferences) as if the effect is “zero or very small.” It might not be exactly zero, but it is small enough.

We can use two one-sided tests to statistically reject effects ≤ −0.3 and ≥ 0.3. This is the basic idea of the TOST (two one-sided tests) equivalence procedure.

The idea is simple, and it is conceptually similar to the traditional null-hypothesis test you probably already use to reject an effect of zero. But whereas all statistics programs will allow you to perform a normal t test, it is not so simple to perform a TOST equivalence test.

Psychological science really needs a way to show effects are too small to matter (see Morey & Lakens, 2016). So I made a spreadsheet and R package to perform the TOST procedure. The free TOST package is available from the Comprehensive R Archive Network (CRAN), which means you can install it using install.packages(“TOSTER”).

Let’s try a practical example using the vignette that comes along with the R package.

Eskine (2013) showed that participants who had been exposed to organic food were substantially harsher in their moral judgments relative to those in the control condition (\( d = 0.81 \), 95% confidence interval: [0.19, 1.45]). A replication by Moery and Calin-Jageman (2016, Study 2) did not observe a significant effect (control: \( n = 95, M = 5.25, SD = 0.95 \); organic food: \( n = 89, M = 5.22, SD = 0.83 \)). The authors used Uri Simonsohn’s recommendation to power their study so that they had 80% power to detect an effect that the original study had 33% power to detect. This is the same as saying: We consider an effect to be “small” when it is smaller than the effect size the original study had 33% power to detect.

With \( n = 21 \) in each condition, Eskine had 33% power to detect an effect of \( d = 0.48 \). This is the effect the authors of the replication study designed their experiment to detect. The original study had shown an effect of \( d = 0.81 \), and the authors performing the replication decided that an effect size of \( d = 0.48 \) would be the smallest effect size they would aim to detect with 80% power. So we can use this effect size as the equivalence bound. We can use R to perform an equivalence test:

```r
install.packages("TOSTER")
library("TOSTER")
TOSTtwo(m1=5.25, m2=5.22, sd1=0.95, sd2=0.83, n1=95, n2=89, low_eqbound_d=-0.43, high_eqbound_d=0.43, alpha = 0.05)
```

# Which gives us the following output:

Using alpha = 0.05 Student's t-test was non-significant, t(182) = 0.2274761, p = 0.8203089

Using alpha = 0.05 the equivalence test based on Student's t-test was significant, t(182) = -3.026311, p = 0.001417168

TOST results:

- t-value 1 p-value 1 t-value 2 p-value 2 df
- 3.481263 0.0003123764 -3.026311 0.001417168 182

Equivalence bounds (Cohen's d):
- low bound d high bound d
- 1 -0.48 0.48

Equivalence bounds (raw scores):
- low bound raw high bound raw
- 1 -0.4291159 0.4291159

TOST confidence interval:
- Lower Limit 90% CI raw Upper Limit 90% CI raw
- 1 -0.1880364 0.2480364

Daniel Lakens is an experimental psychologist at the Human-Technology Interaction Group at Eindhoven University of Technology, the Netherlands. His main lines of empirical research focus on conceptual thought and meaning. In addition, he writes applied articles on statistics and teaches a free “Improving Your Statistical Inferences” MOOC on Coursera. He can be reached at D.Lakens@tue.nl.
You see, we are just using R like a fancy calculator, entering all the numbers in a single function. But I can understand if you are a bit intimidated by R. So, you can also fill in the same info in the spreadsheet.

Using a TOST equivalence procedure with $\alpha = .05$ and without assuming equal variances (because when sample sizes are unequal, you should report Welch’s $t$ test by default), we can reject effects larger than $d = 0.48$, $t(182) = -3.03$, $p = .001$.

The R package also provides a graph, displaying the observed mean difference (in raw scale units), the equivalence bounds (also in raw scores), and the 90% and 95% CIs. If the 90% CI does not include the equivalence bounds, we can declare equivalence.

Moery and Calin-Jageman concluded from this study: “We again found that food exposure has little to no effect on moral judgments.” But what is “little to no”? The equivalence test tells us the authors successfully rejected effects of a size the original study had 33% power to reject. Instead of saying “little to no,” we can put a number on the effect size we have rejected by performing an equivalence test.

If you want to read more about equivalence tests, including how to perform them for one-sample $t$ tests, dependent $t$ tests, correlations, or meta-analyses, you can check out a practical primer on equivalence testing using the TOST procedure I’ve written. It’s available as a preprint on PsyArXiv. The R code is available on GitHub.

Daniel Lakens will speak at the 2017 APS Annual Convention, May 25–28, 2017, in Boston, Massachusetts. He also will speak at the International Convention of Psychological Science, March 23–25, 2017, in Vienna, Austria.

TOSTER Materials
- The TOSTER spreadsheet is available from https://osf.io/q253c/
- The TOSTER R package can be installed from CRAN using install.packages("TOSTER"): https://CRAN.R-project.org/package=TOSTER
- The practical primer on equivalence testing using the TOST procedure is available from https://osf.io/preprints/psyarxiv/97gcd/
- The R code is available from https://github.com/Lakens/TOSTER
- Detailed example vignettes are available from https://cran.rstudio.com/web/packages/TOSTER/vignettes/Introduction-ToTOSTER.html3839

References
After teaching several introductory courses on R, I have come to realize that the best way to get people excited about programming is to follow two rules. Rule 1: Make it simple for them to get started. Rule 2: Make it fun. The **yarr** R package is designed to follow these rules.

One of the main tools in the **yarr** package is the `pirateplot()`. The purpose of the pirateplot was to answer the following question: How can I quickly understand the relationship between one or more categorical independent variables and a continuous dependent variable? This question comes up quite often in experimental research using factorial designs. For example, an experiment might compare four different experimental conditions \((a, b, c, \text{and } d)\) on a dependent variable \((y)\).

The standard way to visualize a factorial design is a bar plot like the one shown in Figure 3. A bar plot shows the mean of each distribution with error bars. Bar plots are standard practice because they are simple and easy to create with any statistical software. They also provide a picture of the data that appears straightforward. On our bar plot, it looks like there was no difference between conditions on the dependent variable. Indeed, an analysis of variance on these data will confirm this conclusion with a \(p\) value of .939.

But is this conclusion justified? No. The problem is that our data-visualization tool, the bar plot, obscured important patterns in the data by hiding the raw data underlying each group. Statisticians have shown again and again that because bar plots hide raw data and distributional information, they obscure important patterns in data, from multiple modes to outliers. Yet despite this overwhelming evidence that bar plots are insufficient for conveying patterns in data (Cleveland, 1984; Lane & Sándor, 2009; Weissgerber, Milic, Winham, & Garovic, 2015), we are still routinely publishing bar plots in our top journals (Cooper, Schriger, & Close, 2002).

Why are we still using bar plots to visualize data? Although there are bar plot alternatives such as violin plots (Hintze & Nelson, 1998) and bean plots (Kampstra, 2008) that show distributional information, most people simply don’t know what they are or how to create them. Or, if they do know about the alternatives, they simply are not motivated to use them because they either are not simple to get started with (Rule 1) or are not fun (Rule 2).

The pirate plot is designed to be a replacement for bar plots that people will actually want to use. Unlike a bar plot, which shows only descriptive statistics (and possibly some inferential statistics in the form of a confidence interval), a pirate plot simultaneously shows three key aspects of the data: the raw data (shown as individual points), the descriptive statistics (shown as lines), and the inferential statistics (Bayesian highest-density intervals or frequentist confidence intervals, and smoothed densities). A pirate plot of our data is shown in Figure 3 below the bar plot. Here, we can clearly see patterns in the data that the bar plot missed. For example, we see that conditions \(b\) and \(c\) have two distinct subgroups, whereas conditions \(a\) and \(d\) appear to be truly identical. Thanks to the pirate plot, we can immediately see that our previous conclusion about the data, supported by both a bar plot and an analysis of variance, was wrong.

Importantly, the pirate plot follows the two rules of getting people excited about programming. First, it is easy to get started. Once you load the relevant data, you can create a pirate plot simply by typing `pirateplot(y~condition, data=data)`. Second, pirate plots are fun to use. For example, by including the `theme` and `pal` arguments, you can customize your pirate plot with colors inspired by movies and TV shows, including my favorite childhood Saturday morning cartoon, X-Men. In Figure 4, you can see four different versions of plots from exactly the same data created with `pirateplot()` by adding the `theme` and `pal` arguments. The color palettes in the **yarr** package are not restricted to a pirate plot. All of the palettes are contained in the `piratepal()` function and can be easily used in any plot you’d like, such as the scatter plot in Figure 1 using the My Little Pony palette.

I have found that students are much more excited about data when they see it presented in a colorful, informative pirate plot than when it is reduced to a dull bar plot. Indeed, even though I created pirate plots for my students, I find myself using them almost daily in my own analyses. Plots created or inspired by the pirate plot are already being used in publications (Wagenmakers, Beek, Dijkhoff, & Gronau, 2016) and even in research departments at companies such as Pandora.

### References


---

**Nathaniel D. Phillips** is a cognitive scientist at the University of Basel, Switzerland, who is interested in topics relating to learning and decision making under uncertainty, statistical programming, and open science. He can be reached at Nathaniel.D.Phillips.is@gmail.com and be found online at ndpollips.github.io.


---

**Fig. 1.** Scatterplot with the pony palette

**Fig. 2.** xmen

**Fig. 3.** Barplot

**Fig. 4.** theme = 1, pal = 'gray'

theme = 2, pal = 'gray'

theme = 3, pal = 'xmen'

theme = 4, pal = 'gray'
Finding Bootstrap Confidence Intervals for Effect Sizes With BootES

By Kris N. Kirby and Daniel Gerlanc

BootES (pronounced “booties”) is a free software package for R that computes both unstandardized and standardized effect-size measures for most experimental research designs and finds bootstrap confidence intervals (CIs) for those effect sizes (Gerlanc & Kirby, 2015). We developed bootES to help fill the gap between the data-analysis methods that existing software offers and current recommendations for best practices. Our work follows in the footsteps of a long line of proponents of what has come to be called the “new statistics” (see Geoff Cumming’s article in the 2014 “March Methodology Madness” issue of the Observer).

The tools of reform. Null-hypothesis significance testing (NHST) is logically invalid as an inferential method, and the p values it yields mislead us about the magnitudes of effects because they are functions of sample size (see, e.g., Loftus, 1996). Consequently, current best practice requires that psychological scientists report:
- effect-size estimates, which are not affected by sample size; and
- their CIs, which communicate the precision of the effect-size estimate and contain all the information in a p value and more.

Many research journals, including Psychological Science, are urging researchers to shift from reliance on NHST to effect-size estimation and other preferred techniques (Eich, 2014, p. 5) and are setting the reporting of appropriate effect sizes and confidence intervals as minimum expectations for publication. So why have so few published research articles in those journals met these expectations?

We believe the biggest roadblock has been the lack of appropriate statistical software. The big commercial stats programs were all developed during the heyday of NHST. Most do not even report standardized effect sizes for many common research designs, such as mixed-factorial designs. And when they compute CIs at all, they typically use traditional CI methods that are known to have poor coverage (i.e., their 95% CIs do not actually cover the population value 95% of the time).

As a consequence, psychological scientists until recently have lacked readily available tools for meeting even “minimum expectations,” let alone best practices. Critics of NHST have had difficulty gaining momentum for reform, in part because the lack of viable alternatives has provided an excuse to stick with tradition. One of our goals in creating bootES was to provide a viable alternative to NHST, helping to bring best practices within everyone’s reach.

Why bootstrap CIs? Bootstrap CI methods have an advantage over other methods in that they do not assume that the data are drawn from a normal distribution, or that the shape of the distribution is even known. Instead, with bootstrap methods one approximates the unknown distribution from the data sample itself. A program repeatedly draws random samples with replacement (called resamples) from the original data sample and calculates the desired effect size anew for each resample. For example, the program might draw a resample, calculate an effect size such as Cohen’s d, and repeat this 2,000 times, yielding 2,000 Cohen’s ds. The distribution of these 2,000 effect-size estimates then serves as an empirical approximation of the population distribution of the effect size, and we can use this distribution to find a CI for the population effect size.

For example, to find a 95% CI using the percentile method, we simply put the 2,000 resampled effect sizes in rank order and locate the values at the 2.5 and 97.5 centiles, which contain the middle 95% of the distribution. Such CIs make no assumptions about the shape of the distribution of effect sizes in the population. (Although the percentile method is more intuitive, bootES actually uses by default the bias-corrected-and-accelerated [BCa] method, which tends to have better coverage than the percentile method.)

In most real-world research, the shapes of the population distributions of data and effect sizes are unknown. Thus, we believe the best practice in most research is to report bootstrap CIs. In cases when one has good reason to believe that the data is normally distributed, we recommend “exact CI” methods, as implemented in the pioneering software by APS Fellow Geoff Cumming (2016), Ken Kelley (2007), and

Kris N. Kirby is a professor in the Cognitive Science program and the Department of Psychology at Williams College. He conducts research on choice and decision-making, especially intertemporal choice and models of utility. He can be reached at kkirby@hush.com.

Daniel Gerlanc is the Founder and President of Enplus Advisors, a Boston-based consulting firm, where he specializes in solving problems at the intersection of data science and software architecture. He is a graduate of Williams College.
James H. Steiger and Rachel T. Fouladi (1992). Although the advantages of bootstrap and exact methods have been known for decades, it is only in recent years that personal computers have become fast enough to make them practical for everyday data analyses. BootES makes bootstrap methods readily available, and for typical data sets the computations take at most a few seconds.

Why R? The first author (Kris) began teaching bootstrap CI methods in his undergraduate classes using customized functions written in commercial software. However, he wanted to enable his students to take their skills with them when they graduated and to use those skills anywhere without an expensive site license. The second author (Dan) encouraged him to implement his functions in R, a free, open-source, cross-platform statistical language and environment running on macOS, Windows, and Linux operating systems (R Development Core Team, 2016). Teaching students to perform data analyses in R means they will be able to employ those skills for free wherever they go. Eventually, Dan took over the programming of bootES in R, we greatly expanded bootES’s initial functionality, and Dan pulled it together into a package available for all R users.

This brings up another huge advantage of using R over commercial software: The Comprehensive R Archive Network (CRAN, 2017) team allows R developers to submit to their package repository specialized packages that meet CRAN’s quality-control standards. Once these packages are deposited, R users can easily download and install them within R — also for free — for their own use. A large number of wonderful packages for psychological scientists can be found in the repository, such as APS Fellow William R. Revelle’s (2017) psych package and Kelley’s (2016) MBESS package — and, of course, bootES. At this writing, bootES has been downloaded more than 13,000 times just from the one mirror site that tallies such numbers.

Some may be intimidated by R’s command-line interface and its reputation for a steep learning curve. Indeed, R’s online documentation is esoteric and can be hard to follow. However, R is easy to learn when one is shown how to use it. In Appendix I of our article describing bootES, we provided examples of most of the R commands that a data analyst needs, from importing the data to saving the results (Kirby & Gerlanc, 2013). With just a little experience, even first-semester undergraduate students can copy, paste, and edit example commands as easily and efficiently as they can search through drop-down menus and dialog boxes to do analyses in commercial software. Users can then gradually learn to use more of R’s powerful built-in functionality, including its publication-quality graphics.

We put a great deal of effort into making bootES as user-friendly as possible. All functions are invoked by a single command, and bootES makes educated guesses based on the data structure about the type of effect size and CI that the user wants, requiring the user to specify a minimum of options. For example, with the command bootES(myVariable), bootES finds the mean of the single variable myVariable and its 95% CI based on 2,000 replications. In contrast, when one submits two variables as arguments, as in bootES(c(variable1, variable2)), bootES finds the correlation between variable1 and variable2 and the 95% CI for that correlation.

Of course, optional arguments allow one to change the defaults, such as by selecting among several standardized effect sizes. For example, to find Hedge’s g for the mean of the effects represented by myVariable, one simply specifies the effect type with an option, as in bootES(myVariable, effect.type=”hedges.g”). In Kirby and Gerlanc (2013), we show how to change all of the defaults and explain how to use additional arguments to find more complex effect sizes such as those for contrasts in between-subjects, within-subjects, and mixed-factorial designs. BootES also finds CIs for slopes and for differences between correlations.

Why contrasts? Consistent with long-standing best-practice recommendations, bootES computes effect sizes only for 1-degree-of-freedom (df) effects, also known as contrasts or focused comparisons (see, e.g., Rosenthal & Rosnow, 1991, pp. 467–469, 486). Multi-df effects, also called omnibus effects or unfocused comparisons, are ambiguous in their interpretation, rarely of scientific interest, and superfluous when accompanied by a priori or post hoc contrasts. Thus, when one has more than two conditions for comparison, bootES encourages best-practice analyses by requiring the user to define within-subject contrasts in the data set itself (using a spreadsheet or R) and to define between-subjects contrasts with arguments to the bootES command, which allows bootES to resample within conditions properly. This approach effectively reduces all factorial designs to contrasts on one-way designs; we believe the transparency and interpretational clarity of this approach leads to better scientific inferences than does the automatic generation of the full output of default effects in factorial ANOVAs.

Most ambitiously, we see bootES not as a supplement to the big commercial programs but as their replacement. With bootES and with knowledge of how to compute contrasts in factorial designs, a psychological scientist can find effect sizes and CIs for just about any type of experimental design that he or she will encounter. When best practices are free, why pay for second best? 


References


Loftus, G. R. (1996). Psychology will be a much better science when we change the way we analyze data. *Current Directions in Psychological Science*, 6, 161–171.

---

**CALL FOR FELLOWS NOMINATIONS**

**DEADLINE FOR SPRING REVIEW: APRIL 1, 2017**

Fellow status is awarded to APS Members who have made sustained outstanding contributions to the science of psychology in the areas of research, teaching, service, and/or application. Fellow status is typically awarded for one’s scientific contributions; however, it may also be awarded for exceptional contributions to the field through the development of research opportunities and settings. Candidates will be considered after 10 years of postdoctoral contribution.

**NOMINATION REQUIREMENTS**

- A letter of nomination specifying why the candidate is judged to have made sustained outstanding contributions.
- The candidate’s current curriculum vitae.
- Additional letters of support from two outstanding contributors to the field of scientific psychology familiar with the nominee’s work, one of whom must be an APS Fellow.

**Fellows Committee**

Milt Hakel, Bowling Green State University (Chair)
BJ Casey, Yale University
Sandra Graham, University of California, Los Angeles
Kathy Pezdek, Claremont Graduate University
Mike Rinck, Radboud University, The Netherlands
Kees van den Bos, Radboud University and Utrecht University, The Netherlands

For more information and to submit a nomination, please visit www.psychologicalscience.org/members/fellows/aps-fellow-nomination

Electronic submissions are required.
BayesMed and statcheck

Practical Tools for Improving Psychological Science

By Michèle B. Nuijten

Many psychological scientists have blamed the field’s replication crisis — which has illuminated the excess of statistically significant findings in the literature — to the fact that most conclusions are based on p values (Wagenmakers, Wetzels, Borsboom, & van der Maas, 2011). Critics say p values are often wrongly interpreted, can’t quantify statistical evidence, and can lead even a null effect to become significant as sample sizes increase (Hoekstra, Finch, Kiers, & Johnson, 2006; Wagenmakers, 2007). There is also evidence that p values are often inconsistently reported, which could lead to incorrect conclusions (see, e.g., Nuijten, Hartgerink, Van Assen, Epskamp, & Wicherts, 2016).

As an attempt to start solving the problems surrounding p values, my colleagues and I developed two seemingly very different R packages: BayesMed, a package for a default Bayesian hypothesis test for mediation (Nuijten, Wetzels, Matzke, Dolan, & Wagenmakers, 2014; 2015), and statcheck, a package to extract statistical results from articles and recompute p values (Epskamp & Nuijten, 2014; Nuijten et al., 2016). In this article, I will explain the rationale behind and use of each of the two R packages, both of which hopefully can improve scientific practice in psychology.

BayesMed

There’s a simple way to solve the problems surrounding p values: Stop using them. Instead, conclusions can be based on Bayesian statistics. The main principle in Bayesian statistics is that you have a prior belief about an effect, and based on observed data you “update” your prior belief to a posterior belief. This posterior belief is quantified as the probability that your hypothesis is true, given the data. You can also calculate Bayes factors, which (roughly) indicate to what extent one hypothesis is more likely than another.

Using Bayesian statistics has a couple of advantages over using p values. For instance, Bayes factors allow you to quantify evidence in favor of or against a hypothesis. If you calculate a Bayes factor for a null hypothesis versus an alternative hypothesis, and you find a Bayes factor of 10, it tells you that the null hypothesis is 10 times more likely than the alternative. If you find a Bayes factor of 1/10, the alternative would be 10 times more likely. Also, a Bayes factor close to 1 tells you that there was insufficient information in the data to draw a conclusion. This method provides a great advantage over using p values: With Bayesian statistics, you are able to distinguish between situations in which the null hypothesis is very likely and situations in which your data are ambiguous. A nonsignificant p value, on the other hand, can’t be used to distinguish between these situations. Furthermore, in the Bayesian framework, you are free to collect more data until a clearer story emerges, since Bayes factors eventually converge to the correct decision. In contrast, p values converge to significance when the sample size increases — regardless of the true effect — which leads to an increased rate of false-positive findings.

Although the basic theory underlying Bayesian statistics about updating your beliefs based on data can be quite intuitive, the implementation is often complicated, especially for applied researchers with little mathematical background. To make Bayesian statistics more accessible, we developed BayesMed: an R package that performs default Bayesian hypothesis tests for correlation, partial correlation, and mediation (Nuijten et al., 2015; Nuijten et al., 2014).

BayesMed doesn’t require advanced programming skills. For instance, to test whether the effect of x on Y is mediated by M, you need only one line of code: “jzs_med(independent=X, dependent=Y, mediator=M).” The “jzs” in “jzs_med” stands for the default, uninformative “Jeffreys-Zellner-Siow” prior that is used in the calculations. There are similar functions to test for correlation (jzs_cor) and partial correlation (jzs_partcor). These functions return posterior probabilities and Bayes factors for each of the relations between the independent, dependent, and mediator variable and an overall Bayes factor for mediation (for details, see Nuijten et al., 2015).

We chose to focus on tests for correlation, partial correlation, and mediation because these are among the most common tests used in psychology. For Bayesian alternatives for additional tests, such as t tests or analyses of variance, you can use the newly developed (and still developing) software JASP (JASP Team, 2016; https://jasp-stats.org/). JASP offers an easy-to-use “Bayesian SPSS” for common statistical tests. There are plans to incorporate BayesMed’s code into JASP, as well.

Michèle B. Nuijten studied psychological methods at the University of Amsterdam, where she worked on BayesMed and helped Sacha Epskamp with developing statcheck. Currently, she is a PhD candidate at Tilburg University and part of the Meta-Research Center (http://metaresearch.nl). During her PhD project, she took over the maintenance of statcheck. She can be reached at m.b.nuijten@tilburguniversity.edu and online at http://mbnuijten.com.
Software packages such as BayesMed and JASP offer a simple alternative to using $p$ values and can hopefully help with redirecting the focus from significant $p$ values toward strength of evidence.

The BayesMed R package can be downloaded here: https://cran.r-project.org/web/packages/BayesMed/index.html.

**statcheck**

Regardless of whether you agree that Bayesian statistics should be preferred over frequentist statistics, most results in psychology are still based on $p$ values, so it is important that these results are at least correctly calculated and reported. However, there is evidence that as many as half of published psychology articles contain at least one result in which the $p$ value does not match the reported test statistic and degrees of freedom; additionally, in roughly one out of eight published articles, the reported $p$ value leads to a different statistical conclusion than the recomputed $p$ value (Bakker & Wicherts, 2014; Caperos & Pardo, 2013; Nuijten et al., 2016; Wicherts, Bakker, & Molenaar, 2011). These inconsistent results can lead to wrong substantive conclusions and affect meta-analyses.

The calculations needed to check the consistency of a result are quite straightforward. However, searching articles by hand to extract statistical results and then recomputing all $p$ values is time consuming and error prone. In order to solve this, we developed the R package statcheck (Epskamp & Nuijten, 2014). Statcheck automatically extracts statistical results from articles and recomputes the $p$ values. At the moment, statcheck recognizes $t$, $F$, $\chi^2$, $r$ (correlation), and $Z$ tests that are reported in APA style, and when recomputing $p$ values it takes into account rounding of the reported test statistic and one-tailed testing.¹

One of the main advantages of statcheck is that researchers can easily use it to check their manuscript for accidental inconsistencies before submitting to a journal. Besides detecting statistical inconsistencies, statcheck also offers an easy tool to quickly extract published statistics for other analyses. For instance, with statcheck data, you can estimate the power in a selection of literature or determine effect-size distributions or $p$-value distributions (see, e.g., Hartgerink, Van Aert, Nuijten, Wicherts, & Van Assen, 2016).

There is a detailed manual for statcheck available with instructions on its installation and use: http://rpubs.com/michelleenuijten/statcheckmanual. Researchers who are unfamiliar with R can use the new Web app at http://statcheck.io, which includes statcheck’s basic functions.

Statcheck can also be used in the review process, both prepublication (see details about the pilot test with statcheck at *Psychological Science*: www.psychologicalscience.org/publications/psychological_science/ps-submissions) and postpublication (Hartgerink, 2016).

All statcheck data from our 2016 article (Nuijten et al., 2016) are freely available online (https://osf.io/e9qbp/).

Michele B. Nuijten will speak at the 2017 APS Annual Convention, May 25–28, 2017, in Boston, Massachusetts.

¹ Note that when one of the three components of an NHST result (test statistic, degrees of freedom, or $p$ value) is adjusted to correct for multiple testing, post hoc testing, or violations of assumptions, the result becomes internally inconsistent and statcheck will flag it as such.

**References**


The upcoming APS 29th Annual Convention will feature a host of workshops to introduce attendees to the latest methodological techniques, tools, and practices. The convention will be held May 25-28 in Boston, Massachusetts. Workshops are open to Convention and/or Teaching Institute registrants only and require separate registration. They include a presentation by psychological scientist Rebecca C. Ferrer of the National Cancer Institute on the common scientific and methodological problems that can hinder funding applications’ navigation through review and programmatic prioritization.

Other workshops include:

- **Video Coding, Sharing, and Reuse: Databrary and Datavyu**
  APS Fellow Karen E. Adolph, New York University

- **Introduction to R Statistical System**
  APS Fellow William R. Revelle and David M. Condon, Northwestern University

- **Sara Weston**, Washington University in St. Louis

- **Bayesian Inference With JASP: A Fresh Way to Do Statistics**
  Eric-Jan Wagenmakers, University of Amsterdam, The Netherlands

- **Conducting Daily Life Research With the EAR Method**
  Matthias R. Mehl, The University of Arizona

- **How to Conduct Reproducible Psychological Science: A Tutorial Overview**
  Tal Yarkoni, The University of Texas at Austin

- **Documenting the Research Workflow as It Happens**
  Lorne J. Campbell, University of Western Ontario, Canada

- **Everything You Ever Wanted to Know About Experience-Sampling Methodology**
  APS Fellow Thomas R. Kwapił, University of Illinois at Urbana-Champaign

- **Multilevel Structural Equation Modeling**
  Zhen Zhang, Arizona State University

- **Now They See It: Visual Communication of the Patterns in Your Data**
  Steven L. Franconeri, Northwestern University

- **Social Relations Modeling of Dyadic Data**
  APS Fellow Thomas E. Malloy, Rhode Island College

- **Computational Modeling of Decision-making Tasks: Modeling Can be as Easy as Doing a T-test**
  Woo-Young Ahn and Nathaniel Haines, The Ohio State University

- **Easing the Anxiety of Being Human**
  James Carmody, University of Massachusetts Medical School

For the full schedule and details of the 2017 workshops, visit www.psychologicalscience.org/conventions/annual/2017-workshops

Visit https://www.psychologicalscience.org/career-resources/methodologycenter
Data on Display

Using Graphical Descriptives to Improve Transparency

By Louis Tay, Scott Parrigon, Qiming Huang, and James M. LeBreton

In line with our field’s goals of improving openness, methodological rigor, and reproducibility of science, graphical descriptives (GDs) — the visualization of research data — can be used in the research process and eventually be developed into a routine component of the publication process. GDs can serve as quick and efficient checks for authors, reviewers, and the general scientific audience to assess data distributions, variable relations, outliers, and the appropriateness of statistical analyses while maintaining a level of information privacy and security.

In order to promote scientific reproducibility, GDs provide as much information about the data as possible while balancing visual efficacy (e.g., reducing clutter) and the potential need for data privacy so that proprietary data sets cannot be recreated from the visual presentation. They provide efficient, visual checks of data-analytic assumptions and inferences. And they can be conveniently applied and reported to a wide array of data with minimal burden on researchers, reviewers, editors, or publishers.

One way to promote high standards in our science is by publicly disclosing all data. Yet such a tactic has limits, such as the time costs for reviewers and/or the additional financial costs for statisticians to analyze the data. In addition, some areas of psychological science (e.g., industrial/organizational, educational, and health) often rely on proprietary data that cannot be easily shared. Finally, researchers who spend substantial amounts of time, energy, and money collecting data, only to be required to share those data with researchers who have not invested as heavily in the data collection process, may find opening access to their data to be reciprocally unfair.

Given these practical restrictions, suggested alternatives to the public disclosure of data include encouraging researchers to submit the datasets used in their analyses to the journal when they submit their manuscripts for peer review or, similarly, to submit the materials used for their procedures. Researchers are also encouraged to preregister their designs and analytic plans and to utilize the new statistics reporting methods that focus on estimation of effect sizes, confidence intervals, and meta-analyses (e.g., Cumming, 2014; Funder et al., 2014; Nosek & Lakens, 2014).

The proposed GDs approach complements these other approaches by utilizing the strengths of data visualizations to convey rich, nuanced information not easily gleaned by more traditional methods of data reporting (e.g., correlations, means, variances). GDs potentially provide unique insights into fundamental data issues including assessing basic data distributions, (non)linearity between variables, outliers, patterns of missing data, and the tenability of assumptions underlying various statistical analyses. Although such topics are regularly covered in courses on psychological methods and statistics, it is less common to see such topics explicated in our research.

Part of the reason for the lack of reporting of data checks may stem from journal space limitations. However, the growing acceptance of online supplemental material can provide the necessary space for its inclusion. Moreover, the proliferation and availability of new data visualization tools, in traditional statistical software as well as those offered in the free software R, allow convenient data visualizations that are generalizable for a variety of data types and analyses (Chang, 2013; Murrell, 2011). GDs can provide information about univariate and bivariate data distributions, which may improve our understanding of the sample characteristics (mode of the distribution, skew, kurtosis, minimum/maximum value, etc.) and the accompanying psychological phenomena. Such visualizations yield a richer integrative picture of data compared with what is typically gleaned by a cursory review of the descriptive statistics and correlations, although these are also important to examine. Because information presented visually is often more engaging than numeric presentation, and because visualization simultaneously can capture multiple phenomena (e.g., modality, skew, kurtosis), methodological issues may be easier to identify with visualization than with a table of numbers.

The incorporation of GDs can promote best practices for researchers to check their data prior to submission for publication. For example, a basic checklist (cf. “Journal Article Reporting Standards”) asking authors to verify that they explicitly examined the extent to which their data meet the critical assumptions underlying the statistical tools utilized provides an efficient, additional layer of checks in the peer-review system. Thus, GDs can be used to facilitate open discussion concerning the extent to which the requisite assumptions of different statistical analyses have been satisfied (e.g., Brandt, 2012; Ullrich & Schlüter, 2012).

By including GDs in the peer-review process whenever possible, we can strengthen the quality of research by further increasing the transparency of data while maintaining a level of information privacy with minimal burden on researchers, reviewers, and editors. Importantly, GDs could help increase transparency not only in situations where data cannot be shared,
but also as a supplement to data sharing — they can provide a quicker, easier-to-digest snapshot of various data issues than a raw data set is often able to provide.

GDs can enable possible detection of errors in data coding and/or influential outliers. They also can reveal important but unexplored trends that were not of immediate interest to the primary researchers. This can lead to multiple data uses for different research projects and increased opportunities for scientific collaborations.

The incorporation of GDs also can increase the use of inductive methods within psychology (Locke, 2007). The growing interest in “Big Data” is expected to foment the increased use of data visualizations, and GDs are expected to become an increasingly integral tool for uncovering new and interesting psychological phenomena (Keim, Kohlhammer, Ellis, & Mansmann, 2010).

**Group Mean Differences**

An example of the utility of GDs is assessing and reporting group differences — an indispensable part of psychological research. The current standard of reporting effect sizes, though helpful in interpreting findings beyond statistical significance, does not reveal whether specific data points and/or subgroups drive or obscure the effects. This may be especially important when smaller sample sizes are used and group means — which are typically used — can be vulnerable to outliers. The use of GDs can serve to elucidate potentially influential observations when conducting comparisons between group means. As illustrated in the below figure below with two groups (n = 100 per group), an initial mean-difference analysis does not reveal significant differences (t = 0.19, p > .05, d = 0.03) between the two groups. However, an examination of the density and rug plot reveals that this may be a consequence of two subgroups in Group 2, where there is a subgroup of individuals on the low end (x < −2.0) and another subgroup of individuals who are slightly higher (x = .40) than Group 1. A mean-difference GD can provide a more nuanced interpretation of possible drivers of these effects (be they statistically significant or not) — effects that might go undetected using traditional reporting standards. Importantly, these effects should be cross-validated in another sample to prevent capitalizing on chance (see Fig. 1).

We propose that by encouraging GDs as a standard in our field, we can enhance methodological transparency and rigor. One possible path to increasing the use of GDs is to include them as supplemental materials in journal submissions. Another possibility is to provide digital signatures for all submissions noting that data-analysis checks have been completed prior to manuscript submission. This also will help to promote common standards for data-assumption checks that may be shared by authors, reviewers, and the general scientific audience. To provide additional incentives, the current use of Open Practices Badges in *Psychological Science* and *Clinical Psychological Science* could be augmented to include badges for the use of GDs.

In this vein, we have developed a working website (www.graphicaldescriptives.org) that enables researchers to generate GDs. In its current form, our website emphasizes the more rudimentary plots that are likely most useful for data that do not have sophisticated data structures (e.g., dyadic data, nested data). Moving forward, we will expand the tools available on the website so that it may be used to generate GDs for different types of data formats and structures. This would include, but not be limited to, experimental data with different designs, multilevel data, and time-series data. We also plan to expand the website to include interactive tools that facilitate researchers uploading their data to a secure website so that other researchers can interactively visualize data and, if interested, obtain permissions to collaborate on extensions with the primary authors, especially for sensitive or proprietary data. Moreover, with the growing interest in Big Data, a critical challenge for the current platform would be to provide GD tools that would be able to handle the processing demands of Big Data sets and remaining visually efficacious by utilizing techniques such as data binning and automatic scaling of plots. Finally, we are collaborating with data visualization experts to implement methods for promoting data transparency while also ensuring privacy protections so that proprietary/confidential data sets cannot be recovered wholesale from data visualizations.

We believe that there will be a growing need for GDs in the field of psychological science if we are to increase data transparency and methodological rigor. We hope that key stakeholders and researchers can join in our efforts to further the use of GDs in journals and the development of the GDs platform.  

---

*This story was adapted from a longer article published recently in Perspectives on Psychological Science, 11, 692–701. doi:10.1177/1745691616663875.*

---

**Fig. 1. Mean difference: Density and rug plots.**
ICPS Pre-Conference Teaching Institute | 23 March 2017

Opening Plenary

Culture: What It Is, Why It Matters, and How to Teach It

Hazel R. Markus, Department of Psychology, Stanford University, USA

Concurrent Sessions

Essential Technology for Teaching Psychological Science

Susan M. Frantz, Department of Psychology, Highline College, USA

Learning and Teaching of Psychology in Europe: Challenges at the Macro and Micro Level

Stephan Dutke, Department of Psychology, Universität Münster, Germany

‘Learning Works Best if …!’ How Do University Lecturers and Students Think About Teaching and Learning?

Regina Jucks, Department of Psychology, Universität Münster, Germany

What Should Developmental Psychology Students Be Learning About At-Risk Children? An Update on Research and Intervention Programs

Silvia H. Koller, Department of Psychology, Universidade Federal do Rio Grande do Sul, Brazil

Rapid Growth and Internationalization of Psychological Science Programs in the Developing World

Nebi Sümer, Department of Psychology, Orta Doğu Teknik Üniversitesi, Turkey

References and Further Reading


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.

Visit David G. Myers at his blog “Talk Psych” (www.talkpsych.com). Similar to the APS Observer column, the mission of his blog is to provide weekly updates on psychological science. Myers and DeWall also coauthor a suite of introductory psychology textbooks, including Psychology (11th Ed.), Exploring Psychology (10th Ed.), and Psychology in Everyday Life (4th Ed.).

Why Teach Methods?

By C. Nathan DeWall

Psychologists speak a funny language. Our friends see slot machines; we see variable-ratio schedules. Our spouses seem stumped as to why a colleague exclusively dates coworkers; we cite the mere-exposure effect. At family gatherings, our parents wax poetic about the dozens of random events that culminated in their marriage. We let it slip that correlation does not imply causation.

Yes, we psychologists can rub others the wrong way with our obsession with methodological discussions. But this foible shouldn’t keep us from teaching research methods. Imparting this knowledge to students gives them the ability to become better consumers of knowledge, to think critically, to understand other research, and to become scientific authorities.

In what follows, I discuss some practical matters about how to approach teaching methods and also present some activities to help students grasp basic methodological concepts.

When I interviewed for faculty positions, people asked if I was willing to teach so-called service courses. I nodded, vaguely aware of the pact I had just made with my interviewers. Service teaching, I would later learn, involved taking on courses that helped the department but that few people wanted to teach. Many faculty members avoid teaching methods because they would rather teach courses in their content area of expertise. I get that. Teaching methods isn’t always fun, but it is important. A methods course teaches students the language of how to do psychological science.

Here are three things I try to keep in mind when approaching my methods courses:

- **Know Your Audience.** Before I teach a methods course, I have coffee with someone who has previously taught it. I get a read on students’ levels of preparation, what workloads they can manage, and what worked and what didn’t when the course was taught before. I try to remember that few students will ever enjoy methods as much as professors do. What is clickbait to professors — articles on Bayesian statistics and multitrait-multimethod matrices — may exceed what the typical undergraduate student can handle. Always challenge students, but remember that they have to start somewhere. Keep it simple.

- **Be Nice.** It’s easy to get grumpy when students don’t understand concepts that you find easy to comprehend. Resist the temptation to talk down to students or embarrass them. Try to imagine what it’s like for them, learning a new language that you already speak fluently. You wouldn’t appreciate it if you moved to a foreign country and the locals insulted you because you didn’t speak their language perfectly the day you arrived. These things take time. Practice patience.

- **Get Students on the MEAL plan.** Teaching methods often serves as a gateway to advanced study. In basic methods courses, this gateway may manifest as helping students take advanced topical courses or secure departmental research assistantships. Advanced methods courses may serve as springboards toward...
graduate study. Regardless of the outcome, I let students know that my role is to motivate (M), educate (E), advocate (A), and learn (L). This MEAL plan lets students know what they can expect from me. By motivating students to learn methods, I hope to help them succeed in upper-level courses. By advocating for them, I will help them use the information they’ve learned in a practical and useful manner. As always, I encourage students to bring new research to class so that we, as a group, can learn new methodological information.

**Activity No. 1: What Does Your Newsfeed Say About Correlation and Causation?**

Most students remember that correlation does not imply causation, but few students recall why. Instructors can begin by reviewing information about what a correlation means (association between two or more variables) and its defining parameters (positive or negative, range from −1 to +1). Next, make sure students understand how the direction problem (e.g., does A→B? vs. B→A?) and the third-variable problem (e.g., does C→A→B?) help explain why correlations do not tell us anything about causality.

Ask your students to use their smartphones, laptops, or other electronic devices to open their newsfeed (e.g., news app, Facebook, Twitter). Working with a partner, have them find at least two examples in the media where causal inferences have been incorrectly made on the basis of inadequate data. Many times headlines will make this mistake (e.g., “Stress Causes Cancer”), making it easy for the trained eye to spot errors. Where are the incorrect conclusions made? Why are they incorrect? What would students have done to offer a valid causal conclusion?

**Activity No. 2: How Reliable Is Your Personality?**

Reliability refers to a measure’s consistency or dependability. We expect some measures to show more reliability than others. For example, personality traits should show high levels of reliability across time because they rely on people’s chronic motivations, thoughts, feelings, and actions. A talkative senior in high school often grows up to become a talkative senior citizen.

This activity will take place over a week. First, give students a brief review of the Big Five personality dimensions: conscientiousness (being organized, responsible, and orderly), agreeableness (being motivated to have positive social interactions), neuroticism (displaying negative emotionality and emotional instability), openness (being cultured, intellectual, and reflective), and extraversion (being talkative and getting energy from social interactions). (A useful acronym is CANOE.) Next, ask students to complete the online measure of the Big Five personality inventory found at www.personalityassessor.com/bigfive/. Have students record their percentile ranking on each personality dimension. One week later, ask students to take the online measure of the Big Five personality inventory again and record their percentile rankings.

Students can form groups of three and discuss the test–retest reliability of their personality responses. How similar were their personality-dimension percentile rankings? Were some personality dimensions more similar over time than others? Why?

**Activity No. 3: Validapalooza**

Validity matters as much as reliability. This activity encourages students to consider many types of validity. Instructors can open a Web browser and ask students to complete the online version of the Ten Item Personality Inventory (Gosling, Rentfrow, & Swann, 2003) at google psy.utexas.edu/scales-were-developed/ten-item-personality-measure-tipi/ten-item-personality-inventory-tipi/. Once students have completed the measure, have them scroll to the bottom of the page, reverse-score the appropriate items, and then average the two items for each respective personality dimension.

As a class, discuss how much the measure has these different types of validity:

- **Content Validity.** Does the questionnaire properly assess the domains it aims to assess? Did it seem to have questions that related to each of the Big Five personality dimensions? Do students who scored high on extraversion feel that they’re talkative, whereas those who scored low feel that they’re more reserved? Do students who scored high on conscientiousness perceive that they are responsible and orderly, whereas those who scored low feel that they often struggle to finish projects or meet their goals?
- **Face Validity.** How well did the questions appear to measure what they were meant to measure? For example, did the questions on the extraversion subscale seem to accurately measure how much a person is talkative and sociable?
- **Convergent Validity.** How closely do you think scores on each dimension would correlate with another measure of the same construct? For example, how much would scores from this personality test correspond to scores on the longer Big Five personality dimension test completed earlier?
- **Discriminant Validity.** How much do you think scores on each dimension would not correlate with constructs that seem unrelated? A measure that correlates with everything describes nothing. What factors might be unrelated to each personality dimension?

In the pioneering days of empirical psychology, one of the greatest honors involved being selected to join a group called the Experimentalists (later renamed the Society of Experimental Psychologists). In 1929, the group’s mission was “to advance Psychology by arranging informal conferences on experimental methodology” (Society of Experimental Psychologists, 2016). The top minds in psychological science would putter around each other’s laboratories, eager to educate each other about cutting-edge methods. Today, teaching experimental methods is considered more of a chore than a privilege.

We might never return to the glory days of research methods. But we can do our best to teach students the unique language of research methods. Doing so will help students understand the methodological building blocks that help make psychological science a reality.

**References**


Mentoring undergraduates as a graduate student can be a great experience for everyone involved. Studies show that undergraduates who participate in research tend to learn to "think like a scientist" and have more knowledge about graduate school and interest in science careers than do their peers (Hunter, Laursen, & Seymour, 2007; Russel, Handcock, & McCollough, 2007). Research also suggests that graduate student mentors gain increased teaching, communication, and supervision skills when mentoring undergraduates (Bettencourt, Bol, & Fraser, 1994; Dolan & Johnson, 2009). These skills increase graduate students' marketability as they transition into the next stage of their career (e.g., faculty position, postdoc, internship). In addition, it can be enjoyable to share your love of the field with a budding psychological scientist. However, as a graduate student mentor it also can be difficult to know how best to support undergraduates. Heather Thiry and Sandra L. Laursen (2011) of the University of Colorado at Boulder identified three types of support — intellectual, professional, and social — that undergraduate research assistants appreciated most from their mentors. In this article, I will discuss methods that graduate students can employ to provide support to undergraduates and to make the mentorship experience enjoyable for both parties.

1. Intellectual Support. Often when undergraduates join a research lab, they have had little or no previous research experience. One study found that undergraduate students often feel they do not understand the "bigger picture" of the projects they work on (Thiry & Laursen, 2011). Meeting one-on-one or in small groups with students to discuss projects is a great way to build your communication and teaching skills while also increasing students' knowledge of the research process. When discussing a project, first provide a general background on the area of research. Narrowing your focus from the broader research to your specific project will give students perspective to understand how the project fits within the field. To engage the students in critical thought about the topic, ask them to provide their guesses about relationships between the variables or about why certain procedures may be utilized in the study. Keeping students engaged will help them make connections between the study and the larger field while also allowing them to practice critically thinking about research.

Once students have an understanding of the project and the larger context of that research domain, assign them specific tasks to help with the project. Research often plays a large role in the day-to-day lives of graduate students; it can be easy to forget that some undergraduates have little experience engaging in basic research activities. You may need to show students how to do things like find university databases for literature searches or navigate SPSS (e.g., entering data, running descriptive statistics). Showing, rather than simply telling, students how to engage in various tasks will ensure that those tasks are being properly completed. For example, when I ask students to run statistical analyses, I first show them how to run the analysis and then have them show me how to do it. Reviewing this process ensures that students understand it and reduces error in the results.

2. Professional Support. Engaging in research is an opportunity for undergraduate researchers to learn the cultural practices and values of the field (Thiry & Laursen, 2011). As a graduate mentor, you can provide students with information about what the next step in their academic career may entail. Simply talking about your experiences in graduate school, such as what you are doing in your classes or how graduate school is different from undergraduate school, can help students understand the steps involved in becoming a psychological scientist. In addition to providing informal information, holding a lab meeting that covers professional development topics such as applying to graduate school or engaging in external research experiences can help students get a glimpse into what their future careers could look like.

Another way to provide professional support is by encouraging students to attend and present at research conferences. Research conferences afford students the chance to interact with the larger professional community. To help students find a good outlet for their presentation, use your knowledge of conferences and understanding of the projects to find the right fit. You can help students find submission deadlines and help them write abstracts or provide feedback on their abstracts.
before submission. Once a submission has been accepted, you can help students create posters by sharing your previous posters and talking about how information is best conveyed in poster format. Additionally, talking about your conference experiences will help ease anxiety students may have about presenting their work at a professional conference.

Speaking with students about your experiences can be helpful as they determine if pursuing a research or academic career is right for them. Informing students of the various opportunities to engage in professional development, such as research conferences, will expose them to areas of the field they may not be able to experience at their home institutions.

3. Social Support. When thinking of the mentor–mentee relationship, it is easy to focus on the science and professional development components because they play large roles in our careers. However, it is also important to consider the social encouragement and support that mentors can give their mentees. Creating a supportive and friendly environment will help students feel comfortable asking questions, providing suggestions, and sharing their ideas. In this collegial setting, your mentees will be confident that they can seek you out for advice and suggestions. Moreover, this positive setting can help keep up lab morale when projects do not go as expected.

Research is a challenging process with occasional setbacks along the way; failed experiments may be undergraduate students’ first experiences with academic disappointment. Modeling for students how to appropriately respond to nonsignificant results or hiccups in the research process will teach them how to effectively deal with such frustrations. Share your past experiences with problems in your studies as well as methods you used to help deal with the stress and disappointment that may result. Provide students with an outlet to discuss their feelings, but also highlight the benefits of the project (even if it didn’t work out), such as learning a new protocol, working with participants, or implementing new statistical analyses.

Overall, mentoring undergraduate students can be a helpful and important role for graduate students. Graduate students can provide insider knowledge of the next stages of a career in psychological science. Although mentoring can be a large time commitment for graduate students, it is a wonderful opportunity to share your excitement about the field, gain skills in communication and organization, and prepare yourself — as well as your mentees — for the next stage in a psychological science career.

References
Coming in 2018!

APS to Launch New Research Methodologies and Practices Journal

Advances in Methodologies and Practices in Psychological Science will publish new types of empirical work along with articles and tutorials on research practices, methods, and conduct. An explicit part of the journal’s mission is to encourage integration of methodological and analytical questions across multiple branches of psychological science.
MEMBERS in the news


Dan Ariely, Duke University, Mashable, December 31, 2016: Can an App Change Human Behavior? This Behavioral Economics Professor Is Banking on It.


Dan Ariely, Duke University, Mashable, December 31, 2016: Can an App Change Human Behavior? This Behavioral Economics Professor Is Banking on It.


Robert B. Cialdini, Arizona State University, Mashable, December 31, 2016: Can an App Change Human Behavior? This Behavioral Economics Professor Is Banking on It.


Michele J. Gelfand, University of Maryland, The New Yorker, December 25, 2016: The Psychological Research That Helps Explain the Election.

Mark T. Greenberg, Pennsylvania State University, NPR, December 30, 2016: Teachers Are Stressed, and That Should Stress Us All.


Eric J. Johnson, Columbia University, Mashable, December 31, 2016: Can an App Change Human Behavior? This Behavioral Economics Professor Is Banking on It.


Alan E. Kazdin, Yale University, NPR, January 5, 2017: When There’s No Therapist, How Can the Depressed Find Help?


Mark R. Lepper, Stanford University, The New Yorker, December 25, 2016: The Psychological Research That Helps Explain the Election.


Lee Ross, Stanford University, The New Yorker, December 25, 2016: The Psychological Research That Helps Explain the Election.


Coverage of research from an APS journal

Podcast included in coverage

2017 APS Convention Speaker

Boston, MA, USA, May 25–28, 2017

Video included in coverage

ICPS Speaker

Vienna, Austria, 23–25 March, 2017

More APS Members in the news at www.psychologicalscience.org/MembersInTheNews
The APS Employment Network is your connection to the best jobs in psychological science. Employers from colleges and universities, government, and the private sector use the APS Employment Network to recruit candidates like you. Visit www.psychologicalscience.org/jobs for additional job postings and to sign up for job listings by email.

observerads@psychologicalscience.org • 1.202.293.9300 • 1.202.293.9350 (fax)

**ALABAMA**

**University of Alabama in Huntsville**  
**Psychology**  
**Visiting Assistant Professor or Lecturer**

The University of Alabama in Huntsville Department of Psychology is seeking applicants for a Visiting Assistant Professor or Lecturer position, for the 2017-2018 academic year. Teaching expectations include Introductory Psychology; Developmental Psychology; undergraduate and graduate courses in research design as well as courses in perception, and the applicant's area of specialization. For a Visiting Assistant Professor appointment, candidates must have a Ph.D. in Psychology and an active and promising research program specializing in I/O Psychology. Lecturers must have an M.A. or Ph.D. in Psychology, and area of specialization is open. We also seek applicants with a strong commitment to teaching, and a willingness to develop ties with the community. Applicants must submit 1) an academic vita; 2) a statement of teaching interests; 3) a statement of research interests; 4) reprints or preprints; 5) all transcripts; and 6) a list of three references. Send these materials to: Jeffrey Neuschatz, Department of Psychology, 301 Sparkman Drive, The University of Alabama in Huntsville, Huntsville, AL 35899 or email your materials to jeffrey.neuschatz@uah.edu. Review of applications will begin immediately. The University of Alabama in Huntsville is an affirmative action/equal opportunity employer of minorities/ females/ veterans/ disabled.

**CALIFORNIA**

**University of California, Irvine**  
**Public Health & Psychology & Social Behavior**  
**Assistant Professor in Salivary Bioscience**

The Department of Psychology and Social Behavior (PSB) and Program in Public Health (PH) at the University of California, Irvine invites applications for a full-time, tenure-track or tenured faculty position in Salivary Bioscience. The position will be at the rank of Assistant or Associate Professor. Candidates must have a doctoral degree in psychology, public health or a related field. The candidate's substantive interests and expertise should contribute broadly to aspects of psychology and population health that are the focus of each of the two recruiting units. Areas of specialization in PSB include affective science, developmental psychology, health psychology, and/or social or personality psychology and, the use of salivary biomarkers in the broad areas of population health, locally, nationally and globally. Areas of specialization in PH include epidemiology, environmental health, and sociocultural diversity and health. Applicants should have an outstanding record of research commensurate with rank, a record of extramural funding, and evidence of excellent teaching and mentoring. Successful applicants will contribute to a broader, interdisciplinary initiative in salivary bioscience at UCI, and will collaborate with other faculty members and research scientists affiliated with a newly established UCI Institute for Interdisciplinary Salivary Bioscience Research (http://iisbr.uci.edu/). Review of applications will continue until the position is filled. To apply, please log onto UC Irvine's recruitment site located at: https://recruit.ap.uci.edu/apply/JPF03801.

**Clinical Psychologist**

$103,848 starting annual (Licensed)

$87,972 starting annual (Non-licensed)

Seeking Clinical Psychologists to join an exceptional team of mental health professionals

California Correctional Health Care Services has one of the largest interdisciplinary treatment teams in the nation. Our staff enjoys the challenges of complex diagnostic evaluations along with the chance to collaborate with talented colleagues.

Not only do we have positions available throughout the state, our flexible work schedules allow our clinical staff to work in one location while living in another community.

Take the first step in changing your future and talk to us about our exceptional team of mental health professionals.

For more information on this exciting career opportunity, please contact Sharon Lovell at Sharon.Lovell@cdcr.ca.gov. You may also apply online at www.ChangingPrisonHealthCare.org or call 877-793-4473.

We offer the the stability that comes with state employment along with generous benefits that include:

- 40-hour workweek
- Comprehensive medical, dental, and vision coverage
- Retirement plan that vests in five years
- 403(b) and 457 plans
- Free on-site, in-person CEUs
- Great work/life balance
- Visa sponsorship opportunities
The University of Chicago invites applications from neuroscientists to direct a new Center for Quantitative Biology and Human Behavior. The goal for the Center is to build on rapidly evolving experimental and analytical approaches in neuroscience to explore individual and collective behaviors that drive higher-order social structures. A key feature of this interdisciplinary center will be to promote interaction of leaders in neuroscience and quantitative biology with researchers in the social sciences, humanities, Chicago Booth School of Business, the Law School, and affiliates of the University, such as Argonne National Laboratory and Marine Biological Laboratory. The University of Chicago recruits outstanding PhD and MD/PhD students and has state-of-the-art research facilities. The Center will benefit from a strong and rapidly growing neuroscience community at the University of Chicago and its Medical Center, which are together on its campus in Chicago’s Hyde Park. Applicants must have a PhD, MD, or equivalent, a record of independent and creative research accomplishments, and qualify for a tenured faculty appointment. We seek a scientist who will establish independently funded research programs, and who will interact successfully with neuroscience colleagues throughout the University of Chicago, including the Biological Sciences Division (BSD), the Humanities Division (HD), the Institute for Molecular Engineering (IME), the Physical Sciences Division (PSD), and the Social Sciences Division (SSD). The Director’s primary faculty appointment will be in one of several departments in the BSD, HD, IME, PSD, or SSD, depending on training and scholarly interests. Investigators with demonstrated leadership skills and experience leading team efforts or building programs are especially encouraged to apply. Those interested in being considered must apply online by submitting a curriculum vitae and statement of research interests at the University of Chicago’s Academic Career Opportunities website at http://tinyurl.com/zyxqlsp. Review of applications will commence on February 20, 2017 and continue until the position is filled.

National Science Foundation

Become a part of our mission to maintain and strengthen the vitality of the US science and engineering enterprise. For over 60 years, the National Science Foundation (NSF) has remained the premier Federal agency supporting basic research at the frontiers of discovery across all fields, as well as science and engineering education at all levels. The responsibilities of the NSF Program Director are constantly evolving. The Program Director is guided by the goals of NSF’s Strategic Plan: (1) transform the frontiers of science and engineering, (2) stimulate innovation and address societal needs through research and education, and (3) excel as a Federal Science Agency. The core strategies NSF staff employs include developing intellectual capital, strengthening the physical infrastructure, integrating research and education, and promoting partnerships. Responsibilities of the Program Director include, for example, long-range planning and budget development for the areas of science represented by the program or program cluster, the administration of the merit review process and proposal recommendations, the preparation of press releases, feature articles and material describing advances in the research supported, and coordination and liaison with other programs in NSF, other Federal agencies and organizations. Apply here: https://www.usajobs.gov/GetJob/ViewDetails/462395400.

Georgetown University

Georgetown University invites applications for a faculty position at the Associate or Full Professor level, in the area of Cognitive Neuroscience with a focus on Human Aging. The position will commence August 1, 2017. We seek to fill the position with an exceptional candidate whose research program has a strong theoretical and experimental basis that employs cutting edge methods and straddles disciplinary boundaries. Candidates from any area of cognitive neuroscience of human aging are welcome. However, we are especially interested in those whose research specializes in the effects of aging on the neural bases of learning or memory in humans. The position will be part of a new initiative bridging the Departments of Psychology and Neuroscience, and the Graduate School of Arts and Sciences. Ideal applicants should have a record of achievement in innovative research. Moreover, they should have demonstrated potential both to develop an outstanding, extramurally funded research program, and to be a leader in their field. The successful candidate is expected to contribute to teaching at the undergraduate and graduate level, and to doctoral training in cognitive neuroscience. Applicants should submit their CV and statements of research and teaching interests. The applicants should also submit the names of three potential reference writers. Before the formation of the short list, applications will be treated confidentially. Applications will be accepted until the position is filled. For inquiries about the position, contact Chandan Vaidya, Chair, Search Committee at cjv2@georgetown.edu or 202-687-4274. Apply at https://apply.interfolio.com/39705.
### ANNOUNCEMENTS

Send items to apsobserver@psychologicalscience.org

#### MEETINGS

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Location</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>29th APS Annual Convention</td>
<td>May 25–28, 2017</td>
<td>Boston, Massachusetts, USA</td>
<td><a href="http://www.psychologicalscience.org/convention">www.psychologicalscience.org/convention</a></td>
</tr>
<tr>
<td>2017 Prague Summer Schools</td>
<td>July 1–8, 2017</td>
<td>Prague, Czech Republic</td>
<td>praguesummerschools.org/</td>
</tr>
<tr>
<td>RAND Summer Institute Conferences on Aging</td>
<td>July 10–13, 2017</td>
<td>Santa Monica, California, USA</td>
<td>rand.org/labor/aging/rsi.html</td>
</tr>
<tr>
<td>European Psychology Learning and Teaching Conference</td>
<td>September 18–20, 2017</td>
<td>Salzburg, Austria</td>
<td>europlat.sbg.ac.at/index.html</td>
</tr>
<tr>
<td>40th Annual National Teaching Institute on the Teaching of Psychology</td>
<td>January 3–6, 2018</td>
<td>St. Pete Beach, Florida, USA</td>
<td></td>
</tr>
</tbody>
</table>

#### GRANTS

Call for Papers for Special Issue With the Topic ‘Addressing Gender Inequality’

Group Processes & Intergroup Relations has issued a call for papers for a special issue examining gender inequality. The aim of this special issue is to provide an overview of the many ways in which gender inequality can, and has been, addressed and the consequences — both intended and unintended — that different approaches, interventions, and policies may have. The journal encourages submissions that examine approaches combatting a range of gender inequalities including workplace, social, political, and economic inequalities as well as inequality in the family and other private spheres. They also encourage submissions of work looking at intersectional issues. The submission deadline is April 1, 2017. For more information, please visit http://gpi.sagepub.com/site/CFPs/SI_Gender_Inequality.pdf. Please direct any inquiries to the guest editors Michelle Ryan at M.Ryan@exeter.ac.uk and Thekla Morgenroth at T.Morgenroth@exeter.ac.uk.

Grants Announced for Child Care, Head Start, Family Strengthening, and Behavioral Intervention

The Administration for Children and Families (ACF) is excited to announce that the Office of Planning, Research, and Evaluation (OPRE) has forecasted their intent to fund Child Care, Head Start, Family Strengthening, and Behavioral Interventions graduate student dissertation grants in 2017. Please visit grants.gov for more information.

#### TRAINING

NIH-Funded Course on ‘Strengthening Casual Inference in Behavioral Obesity Research’

The University of Alabama at Birmingham invites you to join their NIH-funded short course on “Strengthening Casual Inference in Behavioral Obesity Research,” scheduled to take place July 24–28, 2017. The program aims to help attendees better identify causal relations among variables that lead to obesity and discern avenues for treatment and prevention. The nine course modules are designed to provide rigorous exposure to the key fundamental principles underlying a broad array of techniques. Limited travel scholarships are available to young investigators and the application deadline is March 31, 2017. Accepted applicants will be notified no later than April 7, 2017. Women, members of underrepresented minority groups, and individuals with disabilities are strongly encouraged to apply. For full details on the course, please visit https://www.uab.edu/shp/home/energetics/courses/causal-inference-shortcourse/third.

---

More than 3,000 psychological scientists have joined the APS Wikipedia Initiative (APSWI).

Get Started With Your Class

www.psychologicalscience.org/apswi
**Time-Sensitive Material**

**INTEGRATED EYE TRACKING & PHYSIOLOGICAL DATA**

*Wireless, Wearable Data Recording*

**COMPLETE, ROBUST, EASY-TO-USE SYSTEMS**

- Ideal for Psychophysiology, Neuromarketing, Behavioral Studies
- Synchronize Eye Tracking & Biometric Data
- Mobile Data Recording
- Record Natural Gaze Behavior
- Full Line of Signals: EDA, EOG, ECG, Pulse, Respiration, More

*Discover why over 97% of the top 100 universities in the world rely on BIOPAC for their life science research and teaching system needs...*

**REQUEST A DEMO TODAY!**

**BIOPAC Systems, Inc.**

[www.biopac.com](http://www.biopac.com) • [info@biopac.com](mailto:info@biopac.com) • 805 685 0066