Penn Positive Psychology Center Annual Report

May 28, 2019

Martin Seligman, Director
Peter Schulman, Executive Director

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This is a report on the activities of the Positive Psychology Center (PPC). The PPC was officially created November 7, 2003 and is thriving intellectually and financially. It is the leading center in the world for research, education, application and the dissemination of Positive Psychology. It is widely recognized in both the scholarly and public press. The PPC is financially self-sustaining and contributes substantial overhead to Penn.

The mission of the PPC is to promote empirical research, education, training, applications, and the dissemination of Positive Psychology. Positive Psychology is the scientific study of the strengths that enable individuals and communities to thrive. This field is founded on the belief that people want to lead meaningful and fulfilling lives, to cultivate what is best within themselves, and to enhance their experiences of love, work, and play.

SIGNIFICANT DEVELOPMENTS

Book Releases:
- In two books, *Positive Psychotherapy: A Clinician Manual*, and *Positive Psychotherapy: Workbook,* Drs. Rashid and Seligman provide therapists with a session-by-session therapeutic approach based on the science and practices of Positive Psychology that enable individuals, communities, and institutions to flourish. These two books have already been translated into six languages.

- In *The Hope Circuit*, Dr. Seligman looks at the history of his life and the field of psychology, and paints a brighter future for everyone.

- In *Happy Together*, Dr. James Pawelski and Suzann Pileggi Pawelski apply the principles of Positive Psychology to enable thriving romantic relationships based on scientific research.

- In *Grit: The Power of Passion and Perseverance*, Dr. Angela Duckworth shows parents, students, educators, athletes, and business people that the secret to outstanding achievement is not talent but a special blend of passion and persistence she calls "grit." This book has been on the New York Times bestseller list for 31 weeks.

Online Certificate through LPS: Applied Positive Psychology (APOP):

Penn's College of Liberal and Professional Studies (LPS) launched an online Bachelor of Applied Arts and Sciences (BAAS) in the fall of 2018. This online, accredited degree offers a variety of degree concentrations and certificate "clusters" that are designed to meet the needs of working adults and non-traditional students who wish to pursue a liberal arts education with career enhancement in mind.

The Applied Positive Psychology (APOP) certificate is a four-course certificate that launched its first two courses in spring 2019 with support from the Positive Psychology Center. The third and fourth courses of the certificate will be offered in fall 2019 concurrently with the first two classes. APOP develops tools and practices to enhance human flourishing. Students are introduced to the field of Positive Psychology and learn practical strategies that support personal, organizational, and community well-being. The courses teach the theoretical and empirical foundations of human flourishing, how well-being is measured, and what activities increase human flourishing in various contexts and settings.

Online Certificate On Coursera: Foundations of Positive Psychology:

The Positive Psychology Center and the College of Liberal and Professional Studies produced a five-course online specialization on the Coursera platform called Foundations of Positive Psychology, which launched March 2017. Students learn about the theories, research, and applications of Positive Psychology.

The five courses are taught by Positive Psychology Center personnel, including:

- **Positive Psychology: Martin Seligman's Visionary Science**, taught by Dr. Seligman.
  - Student rating = 4.8 out of 5.0 (2,107 ratings).
- **Positive Psychology: Resilience Skills**, taught by Dr. Karen Reivich.
  - Student rating = 4.9 out of 5.0 (861 ratings).
- **Positive Psychology: Applications and Interventions**, taught by Dr. James Pawelski.
  - Student rating = 4.8 out of 5.0 (939 ratings).
- **Positive Psychology: Character, Grit, and Research Methods**, taught by Dr. Angela Duckworth.
  - Student rating = 4.3 out of 5.0 (553 ratings).
- **Positive Psychology Specialization Project: Design Your Life for Well-Being**, taught by Dr. Martin Seligman.

  Dr. Reivich's Resilience Skills course has also been made available to Penn groups, including:

- **Penn Alumni** Relations offered Dr. Reivich's Resilience Skills course to all Penn alumni in the winter of 2018/19 through their Penn Alumni Education program. Within two hours of registration opening, 750 alumni enrolled. This was the fastest sell-out for an alumni course in Penn history. Ultimately, 857 alumni registered, representing 37 U.S. states and 20 countries. Of the 857 alumni who registered, 746 established accounts to access course content. 303 (41%) of those with an established account completed the course, which was the highest completion rate in Penn Alumni Education's five-year course history. In a survey of course participants, 94% reported completing the course and 96% rated both the overall course quality and Dr. Reivich's quality of instruction as "very good" or "excellent".

- Thirty-five **Penn Weekly Paid Professional Staff** took this online course for free in the fall/winter 2018/19 and also attended a lunch meeting with Dr. Reivich to discuss their experience. See the Penn News article: https://penntoday.upenn.edu/news/weekly-paid-professional-staff-learn-resilience-through-free-online-opportunity/

Course for Penn Undergraduates: Pursuit of Happiness Course.

Dr. James Pawelski developed and taught a new course in the spring 2019 semester, PSYC006: The Pursuit of Happiness. The purpose of this course was to use multidisciplinary approaches to help students understand the science and practice of happiness. Students did practical exercises to develop cognitive, emotional, and behavioral skills to increase happiness in their own lives and communities. Students also developed a plan to pursue happiness in their life and community after the course.

This undergraduate course was open to all years, all majors, and a total of 162 students from the four undergraduate schools participated. Recitation sections had a maximum of 11 students per section to keep interaction and engagement high and 8 of the 16 Recitation sections were held in the Positive Psychology Center. Nine MAPP graduates served as Teaching Assistants, including Laura Taylor as head TA.

Although the university course evaluations are not available at the time of this report, 154 students completed an end-of-semester survey we created. We are planning to offer the course again in the spring of 2020. Articles on this course appeared in the Philadelphia Inquirer, Penn Today, and the Daily Pennsylvanian. Here is a link to the Penn Today article: https://penntoday.upenn.edu/news/in-pursuit-of-happiness-new-class-leads-charge

There were nine guest lecturers from across the university:
- Michael Baime, MD, Clinical Associate Professor of Medicine, Director, Penn Program for Mindfulness
- Benoit Dubé, MD, Chief Wellness Officer, University of Pennsylvania
- Angela Duckworth, PhD, Christopher H. Browne Distinguished Professor of Psychology, Senior Scientific Advisor, PPC
- Ashlee Halbritter, MPH, Director, Campus Health
- Frances Jensen, MD, FACP, Professor of Neurology
- Suzie Pileggi Pawelski, MAPP, Author, curriculum consultant for the course
- Judy Saltzberg-Levick, PhD, Resilience Instructor and Curriculum Developer, Penn Resilience Program, PPC
- Martin Seligman, PhD, Zellerbach Family Professor of Psychology, Director of the PPC
- Lyle Unger, PhD, Professor of Computer and Information Science

Positive Education Summit:

The Positive Psychology Center and Eisenhower Fellowships are sponsoring the Positive Education Summit June 7 to 9, 2019 in Philadelphia. The purpose of the Summit is twofold – celebrate the accomplishments of past Positive Education initiatives and plan the future of Positive Education science and practice. About 35 distinguished leaders will attend, including educators from around the world who have pioneered the application of Positive Education in schools, as well as Eisenhower Fellows https://www.efworld.org/

The goal of Positive Education is to increase well-being as well as advance the traditional goals of schooling (literacy, numeracy, and science). There are at least a few reasons to teach Positive Education in schools: (1) To increase well-being and optimism, (2) to prevent mental health problems such as depression and anxiety, and (3) to facilitate learning, creativity, and academic achievement. There is growing evidence from controlled studies that skills can be taught to children and adolescents through relatively brief school-based courses that significantly increase well-being, optimism, resilience, and academic performance, and prevent and reduce depression and anxiety.

Positive Education has taken great strides in the last 10 years, since the founding of this field by Dr Seligman. Good science and good measurement are critical components to ensure ongoing effectiveness and sustainability. There should be rigorous, empirical controlled studies to evaluate impact, effect sizes, duration of effects, and cost-benefit analyses, using measures of well-being, mental health (e.g., depression and anxiety), and academic performance.

We might be in the early stages of a revolution in education. We have an opportunity and a responsibility to guide this transformation and build a new generation of children and adolescents with enhanced academic skills and well-being. Schools can educate students

for flourishing as well as for workplace success, through evidence-based Positive Education programs.

Teaching Award:
- Dr. Angela Duckworth was a recipient of the 2019 College of Liberal and Professional Studies Award for Distinguished Teaching in Professional Graduate Programs.

New Research Findings:

Dr. Seligman and colleagues published two recent articles with particularly significant new research findings under the Positive Soldier Health Grant sponsored by the Robert Wood Johnson Foundation (PI Seligman):

- We examined risk and protective factors for diagnosed posttraumatic stress disorder (PTSD) among the entire eligible cohort of U.S. Army active duty soldiers who deployed to Iraq or Afghanistan between 2009 and 2013 (nearly 80,000 soldiers). Compared to soldiers with average catastrophic thinking, soldiers highest on catastrophic thinking were 29% more likely to develop PTSD, whereas soldiers lowest on catastrophic thinking were 25% less likely to develop PTSD. Soldiers who faced four or more combat stressors were 120% more likely to develop PTSD than soldiers who experienced two combat stressors. Additionally, soldiers higher in catastrophic thinking who also experienced higher combat intensity were 274% more likely to develop PTSD than those low on both. These findings suggest that interventions to reduce catastrophic thinking prior to combat can help the Army lower PTSD casualties.
  Reference: Seligman, M.E.P., Allen, A. R., Vie, L. L., Ho, T. E., Scheier, L. M., Cornum, R., & Lester, P. B. (2019). PTSD: Catastrophizing in combat as risk and protection. *Clinical Psychological Science*, 7(3), 516-529.

- A longitudinal study of over 20,000 U.S. Army soldiers found that pre-deployment optimism was associated with 11% lower odds of reporting new pain following deployment, even after adjusting for combat stress, injury, demographic and military factors. The findings suggest that soldiers with low levels of optimism before they deploy may be at greater risk of developing new pain following deployment and may benefit from scalable interventions designed to increase optimism. This study was published in JAMA Network Open and covered by 14 news outlets, including Reuters and U.S. News & World Report. This study was also featured as the headline story in "Morning Rounds," the official news briefing of the American Medical Association.
  Reference: Hassett, A. L., Fisher, J. A., Vie, L. L., Kelley, W. L., Clauw, D. J., & Seligman, M.E.P. (2019). Association between pre-deployment optimism and onset of post-deployment pain in US Army soldiers. *JAMA Network Open*, 2(2), e188076.

New Resilience Training Contracts:
- **Resilience Training Contracts**. Since 2007, we have delivered about 300 Penn Resilience Programs to more than 60,000 people. Many of these programs are train-the-trainer programs in which we train people how to teach resilience skills to others, using a structured curriculum. Attendees of these programs have gone on to teach these skills to more than a million people around the world.

- **Penn Resilience Program for Law Enforcement Personnel**. In 2018, under a U.S. Department of Justice grant, Penn received a 2-year training contract to design and deliver resilience training for police officers around the country, as well as a train-the-trainer program to teach police officers how to deliver the program to other police officers. The goal of this initiative is to enable them to cope effectively with adversity and stress, build stronger community relations, and lead safe and fulfilling lives personally and professionally.

- **Penn Resilience Program for Health Care**. In FY19, we made a concerted effort to develop clients in health care, to address the growing concerns around burnout and other mental health issues facing physicians and other health care professionals. We have or will soon deliver resilience programs customized for:
  - Yale School of Medicine: Physicians
  - Penn School of Medicine: Faculty and Physicians
  - Sentara Healthcare: Executives
  - Royal College of Surgeons in Ireland: Leadership
  - University of Michigan Medical School: Leadership Development Team
  - Children's Hospital of Philadelphia Foundation: Leadership and Staff

- **New and Ongoing Resilience Training Clients**. We continue to develop new clients and service existing clients, including:
  - Corporate-sponsored community outreach:
    - Penn Resilience Programs for hemophilia patients and their caregivers, sponsored by Genentech
    - Penn Resilience Programs for Oklahoma City public school high school students
  - Corporations (Alcon Vision, Delta Galil, Oklahoma City Thunder NBA team, Deloitte, Kimberly-Clark)
  - Education (Western Governors University, Oklahoma State University, Shipley School, Milken Community Schools, UK public schools)
  - Law enforcement (U.S. DOJ grant, Pennsylvania State Police)
  - Governmental organizations (World Bank; U.S. Department of Defense, Learning & Development Division under the Office of the Secretary, Washington Headquarters Services, UAE Government)
  - Wharton Executive Education programs (Athlete Development Professional Certification Program, Securities Industry Institute, Client Psychology for Certified Financial Planners).

- **Resilience Programs for Penn Employees.** We are delighted to bring our programs to the Penn community. These programs have had a positive response and word-of-mouth has increased demand within Penn. We have been delivering programs to:
  - Penn Division of Public Safety (Maureen Rush): For all police officers and staff.
  - Penn Business Services Division (Marie Witt): For leadership team and their staff.
  - Penn Division of Human Resources (Jack Heuer): For staff.
  - Penn Wharton MBA Staff (Paula Greenberg): For staff.
  - Penn Wharton Computing (Scott McNulty): For Leadership and staff.

- o Penn Office of Audit, Compliance, and Privacy (Greg Pellicano). For staff.
- o Penn School of Social Policy and Practice (Regine Metellus): For staff.
- o Penn School of Medicine (Lisa Bellini, Deborah Driscoll). For faculty and physicians.
- o Penn Professional and Liberal Education (Nora Lewis): For staff.
- o Penn Athletics (Rudy Fuller): For coaches.
- o Penn Athletics (Rudy Fuller): Two-semester course for student athletes.
- o Penn Rodin College House (Kathryn McDonald): For undergraduate students.
- o [Online resilience course through PLE for Penn staff (click here for press coverage)](#).

Outreach Programs:
- **United Nations Global Happiness Council**. Dr. Seligman was appointed the Education Chair of the Global Happiness Council (GHC), under the United Nation's Sustainable Development Solutions Network (SDSN). GHC is a global network of leading academic specialists in happiness and key practitioners in areas ranging from psychology, economics, urban planning, civil society, business and government. The GHC identifies best practices at the national and local levels to encourage advancement of the causes of happiness and well-being.

    Council members oversee the work of six thematic groups (education, workplace, personal happiness, public health, city design and management) who each produce a chapter of policy recommendations in the Global Happiness Policy Report, published annually and presented at the World Government Summit (WGS) in support of the Global Dialogue for Happiness. This report provides evidence and policy advice to participating governments on best practices to promote happiness and well-being. The work of the Council complement the World Happiness Reports and other research on the measurement and explanation of happiness. The aim of the GHC is to survey and share best practice policies drawn from the research literature and government experiences around the globe.

- **The International Positive Psychology Network (IPPA)**. Dr. Martin Seligman played the lead role in creating IPPA, with contributions from Dr. James Pawelski. IPPA's three-part mission is to promote the science and practice of Positive Psychology to enable individuals and institutions to thrive; to facilitate collaboration among researchers, teachers, students, and practitioners of positive psychology around the world and across academic disciplines; and to share the findings of positive psychology with a broad audience. IPPA will host the Sixth World Congress on Positive Psychology in June 2019 in Melbourne, Australia and there are currently more than 1,200 registrants. The Positive Psychology Center will staff a booth at this conference to promote Penn's Online Applied Positive Psychology Certificate program (APOP), Penn's Master of Applied Positive Psychology program (MAPP) and the online Foundations of Positive Psychology Coursera Certificate. Speakers from the PPC will include Dr. Martin Seligman, Dr. James Pawelski, among others. IPPA has thousands of members. http://www.ippanetwork.org/

- **The International Positive Education Network (IPEN).** IPEN was created by Dr. Martin Seligman and Lord James O'Shaughnessy to bring together teachers, parents,

academics, students, schools, colleges, universities, charities, companies and governments to promote a new approach to education: academics + character + well-being. The goals are to support collaboration, change education practice and reform government policy. IPEN hosted the Second World Positive Education Conference in June 2018 in Fort Worth, Texas and there were more than 600 registrants. The Positive Psychology Center staffed a booth at this conference to promote the MAPP program and the online Foundations of Positive Psychology Coursera Certificate. Speakers from the PPC included Dr. Martin Seligman, Dr. James Pawelski, and Dr. Angela Duckworth. IPEN has thousands of members. http://ipen-festival.com/

- **Positive Psychology Lunch Series Talks**. In November 2010, we initiated the Positive Psychology Lunch Series talks, which is held about once each month at the Positive Psychology Center, for the local psychology community. In the last year, we had about 12 speakers**.** These are low-cost talks, in which most speakers are local or visiting Philadelphia for other purposes. These talks will continue in FY20.

- **Positive Psychology Mindfulness Program.** Starting in March 2018, Dr. Michael Baime, founder and Director of the Penn Program for Mindfulness, has been offering a weekly mindfulness course at the Positive Psychology Center, and this is open to the Penn community. Dr. Baime is a leader in this field.

PPC PERSONNEL

Martin Seligman, Ph.D., Director of PPC and Zellerbach Family Professor of Psychology
Angela Duckworth, Ph.D., Christopher H. Browne Distinguished Professor of Psychology
Allyson Mackey, Ph.D., Assistant Professor of Psychology
Paul Rozin, Ph.D., Professor of Psychology
James Pawelski, Ph.D., Director of Education and Senior Scholar
Karen Reivich, Ph.D., Director of Training Programs
Peter Schulman, Executive Director
Michael Baime, MD, Clinical Associate Professor of Medicine, Penn School of Medicine, Director, Penn Program for Mindfulness

Master of Applied Positive Psychology Program (MAPP):
James Pawelski, Ph.D., Director of Education and Senior Scholar
Leona Brandwene, Associate Director
Aaron Boczkowski, Program Coordinator
Laura Taylor, Program Assistant Coordinator
Nicole Stottlemyer, Assistant Coordinator, Positive Education Programs

Humanities and Human Flourishing Project:
James Pawelski, Ph.D., Principal Investigator
Sarah Sidoti, Project Manager
Yerin Shim, Ph.D., Postdoctoral Fellow
Michaela Ward, Research Manager

Resilience and Positive Psychology Training Programs:
Karen Reivich, Ph.D., Director of Training Programs
Peter Schulman, New Business Development, Customer Service, Operations Oversight
Mayra Marquez, Program Manager
Jennifer Knapp, Program Manager
Jenna Roberg Tarrant, Program Manager
Brittney Schlechter, Curriculum Development Manager
Judy Saltzberg, Ph.D., Instructor and Curriculum Developer
Laura Vriend, Assistant Program Manager

Positive Soldier Health Grant:
Loryana Vie, Ph.D., Program Director
Andrew Allen, Statistical Analyst
Whitney Kelley, Statistical Analyst
Emily Stewart, Statistical Analyst

World Well Being Research Grant:
Anneke Buffone, Lead Research Scientist / Postdoctoral Research Fellow
Johannes Eichstaedt, Postdoctoral Fellow
Salvatore Giorgi, Research Programmer
Kokil Jaidka, Postdoctoral Research Fellow
Phillip Lu, Research Programmer
Daniel Preotiuc-Pietro, Postdoctoral Fellow
Jordan Rast, Project Manager

Well-Being Intervention Research:
Dr. Alejandro Adler, Postdoctoral Fellow

Graduate Students with Dr. Seligman:
Jeremy Clifton (Ben Franklin Fellowship)
David Yaden (Ben Franklin Fellowship)

Dr. Allyson Mackey's Research: Brain Plasticity and Development:
Jasmine Forde, Research Coordinator
Anne Park, Graduate Student
Katrina Simon, Research Coordinator
Danny Southwick, Research Coordinator
Ursula Tooley, Graduate Student

Dr. Angela Duckworth's Research: Grit, Self-Control, and Character Development:
Cameron French, Publishing Manager
Parker Goyer, Postdoctoral Fellow
Kyla Haimovitz, Postdoctoral Fellow
Peter Meindl, Postdoctoral Fellow
Tenelle Porter, Visiting Scholar
Abigail Quirk, Research Coordinator
Danny Southwick, Research Scientist
Priya Shankar, Research Coordinator

Paolo Terni, Research Scientist

Information Technology Support Staff:
Tammer Ibrahim, IT Systems Administrator
Peter Odintsov, IT Systems Support Specialist

Undergraduate Student Assistants: Numerous Penn student research assistants help with various projects.

PPC ADVISORY BOARD

The advisory board for PPC and the MAPP program includes:

Larry Gladney / David Brainard
      Associate Dean, SAS
      Edmund J. and Louise W. Kahn Professor for Faculty Excellence
      Professor of Physics and Astronomy
Nora Lewis
      Vice Dean, Professional and Liberal Education
Susan Meyer
      Professor of Philosophy
Michael Platt
      Professor of Neuroscience, James S. Riepe University Professor
      Professor of Neuroscience, Professor of Psychology, Professor of Marketing
Lyle Ungar
      Professor of Computer and Information Science

PPC ADVISORS

Following are some of the leading scholars who have worked with Dr. Seligman in charting the course of Positive Psychology:
- Mihalyi Csikszentmihalyi, Claremont Graduate University
- Edward Diener, Psychology, University of Illinois
- Kathleen Hall Jamieson, University of Pennsylvania Annenberg School of Communication
- George Vaillant, Psychiatry, Harvard University
- Darwin Labarthe, Centers for Disease Control and Prevention
- Roy Baumeister, Florida State University
- Peter Railton, University of Michigan
- Chandra Sripada, University of Michigan

RESEARCH SUMMARIES

Following are descriptions of the current and recent research projects at the Positive Psychology Center:

The Humanities and Human Flourishing: A Multi-Disciplinary Collaboration for Understanding, Assessing and Cultivating Well-Being. Dr. Pawelski (PI) received a research grant from the Templeton Religion Trust for a 3-year grant from July 2017 to June 2020. The purpose is to advance the understanding, assessment, and cultivation of well-being by catalyzing a transformative movement in the humanities and a sustained strategic collaboration between them and the social sciences. Activities include retreats with subject matter experts, assessment development, empirical research, a book series, a website for dissemination, and a capstone conference.

Positive Education in the Philippines: Educating for Academic Success and for Well-Being (Quezon City Academy, PI-Dr. Alejandro Adler). We received a two-year research grant to introduce Positive Education in the Philippines starting with 20 pilot schools. The grant covers baseline measurement in the domains of well-being, academic performance, and health outcomes. It also covers training of teachers, principals, and trainers in the skills to teach and practice Positive Education. Finally, it also covers post-intervention measurement after the end of the program.

Positive Education at The Shipley School (The Shipley School, PI-Dr. Alejandro Adler). We received a two-year research grant to revamp the existing Social Emotional and Ethical Development (SEED) program at The Shipley School using the best empirically grounded measurement tools and interventions, mostly from the field of Positive Psychology. The grant covers baseline measurement in the domains of well-being, academic performance, and health outcomes. We will use the data to continue co-designing a new Positive Education program to be implemented across all constituencies and academic subjects within the The Shipley School. We have conducted a post-implementation measurement nine months after introducing the new program at The Shipley School, an impact evaluation, and we will continue to monitor and evaluate the multi-dimensional impact of our interventions.

Well-Being Research and Practice at The Shawnee Institute: A Research Case Study of Organizational Transformation (The Shawnee Institute, PI-Dr. Alejandro Adler). We received a two-year research grant to conduct multi-level within and between subjects measurement and impact evaluations at The Shawnee Institute to identify enabling moderators, mediators, and mechanisms in their efforts to transform the existing tourist destination into an institute in which research and practice on a different number of subjects is conducted, including well-being.

Promoting Resilience in Post-Conflict Colombian Youth (International Organization for Migration [IOM], PI-Dr. Alejandro Adler). We received a two-year research grant to use the best existing measurement tools from Positive Psychology to measure existing IOM well-being and resilience promotion programs, and using the data, help them redesign their programs to maximize the positive impact they have on post-conflict youth in the country.

Teaching Well-being Improves Academic Performance in Bhutan (Bhutanese Ministry of Education, PI-Dr. Martin Seligman). As part of his doctoral research, Dr. Alejandro Adler conducted a large-scale randomized controlled trial (RCT) in 18 secondary schools (grades 7-12) with a total of 8,385 students in Bhutan. The schools were randomly assigned to an intervention group or a control group. The intervention schools received a positive education program targeting ten non-academic well-being skills. Students in the intervention schools reported significantly higher well-being and they performed significantly better on standardized national exams at the end of the 15-month intervention, and 12 months after the intervention ended.

Teaching Well-being Improves Academic Performance in Mexico (Jalisco Ministry of Education, PI-Dr. Martin Seligman). As part of his doctoral research, Dr. Alejandro Adler conducted a large-scale randomized controlled trial (RCT) in 70 secondary schools (grades 10-12) with a total of 68,762 students. The schools were randomly assigned to an intervention group or a control group. The intervention schools received a positive education intervention targeting ten non-academic well-being skills. Students in the intervention schools reported significantly higher well-being and they performed significantly better on standardized national exams at the end of the 15-month intervention.

Teaching Well-being Increases Academic Performance in Peru (Peruvian Ministry of Education and World Bank, PI-Dr. Martin Seligman). As part of his doctoral research, Dr. Alejandro Adler conducted a large-scale randomized controlled trial (RCT) in 694 secondary schools (grades 7-12) with a total of 694,153 students. The schools were randomly assigned to an intervention group or a control group. The intervention schools received a positive education intervention targeting ten non-academic well-being skills. Students in the intervention schools reported significantly higher well-being and they performed significantly better on standardized national exams at the end of the 15-month intervention.

World Well Being Project (WWBP): Measuring well-being using big data, social media, and language analyses (Templeton Religion Trust, PI-Dr. Martin Seligman). The World Well-Being Project has performed multidisciplinary research at the intersection of psychology, computer science, medicine, and public health. WWBP has developed unobtrusive measurements of the psychological and physical well-being of large populations using written expressions in social media, such as Facebook and Twitter. Using a combination of social media language, traditional survey methods, and existing datasets, WWBP has successfully built predictive language models across a wide range of constructs including (but not limited to) personality (Big Five personality, and the dark triad – narcissism, psychopathy, and Machiavellianism), subjective well-being, income, temporal orientation, religiousity, mental illness, valence and arousal, and partisan bias in new sources. WWBP also uses these techniques to explore how people communicate and perceive one another. For example, in an article in press at Social Psychological and Personality Science, we analyzed the accuracy of people's perceptions of others based on textual cues, and identified the stereotypes people use to categorize others across age, gender, education, and political orientation.

WWBP has successfully used big data to predict physical health outcomes on the individual and county level. In a high profile article published in Psychological Science in 2015, we used language expressed on Twitter to characterize community-level psychological correlates of age-adjusted mortality from atherosclerotic heart disease (AHD). Language patterns reflecting negative social relationships, disengagement, and negative emotions – especially anger –

emerged as risk factors; positive emotions and psychological engagement emerged as protective factors. Most correlations remained significant after controlling for income and education. A cross-sectional regression model based only on Twitter language predicted AHD mortality significantly better than did a model that combined 10 common demographic, socioeconomic, and health risk factors, including smoking and hypertension. We have also demonstrated that counties with higher use of the future tense as well as higher use of action words (e.g. work, plan) have a lower prevalence of HIV. Finally, in a recent Health Affairs article, we compared the content of Yelp narrative reviews of hospitals to the topics in the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey – the US standard for evaluating patients' experiences after hospitalization. Yelp reviews covered an additional twelve domains not found in HCAHPS. These domains most strongly correlated with positive or negative reviews on Yelp, suggesting that Yelp can help policy makers identify the measures of hospital quality that matter most to patients and caregivers.

Finally, WWBP is a pioneer of natural language processing methods and has published in many prominent computer science and computational linguistics outlets in order to disseminate our techniques. For example, we have introduced a method to identify frequent contexts in which a word switches polarity and to reveal which words appear in both positive and negative contexts. We have also explored how stylistic and syntactic variations in writing style relate to authors' age and income, and investigated how well our well-being lexicon from Twitter language translated to Spanish.

These are just a few of the findings from WWBP research. For more details, see the descriptions in the **References** section below.

Measuring the Well-being of the Spanish Population. (Bioiberica, PI-Dr. Martin Seligman). We have produced and validated a model that estimates the regional variation in well-being within Spain (at the level of provinces) from Tweets in Spanish. This included developing a Spanish PERMA (Positive Emotion, Engagement, Positive Relationships, Meaning, Accomplishment) lexicon and developing a Well-Being Map. The results are displayed on the Map, which allows the general population to view variations between regions. Penn will retain the rights to use this lexicon for other studies.

Advancing the Science of Imagination: Toward an "Imagination Quotient" (Templeton Foundation/Imagination Institute, PI-Dr. Martin Seligman). The purpose of this project is to advance the measurement, research, and development of imagination across all sectors of society. This grant is comprised of two main components: (1) An award program to fund researchers interested in the measurement and enhancement of imagination and (2) a series of research retreats during which creative leaders in various fields are invited to exchange and discuss ideas about the nature and enhancement of imaginative abilities. The objective of this component is to generate innovative research questions and to investigate imagination from a domain-specific perspective.

On the Awards: We have funded sixteen imagination-oriented projects in order to stimulate interest and rigorous research in this area. The titles of these projects reflect the diversity of attempts to better understand and cultivate imagination: Assessing & Fostering Visual Imagination through Drawing, A Motivational Approach to the Enhancement of Imagination & Human Flourishing, Introducing imQ: Assessing & Improving Imagination, The Four Factor

Imagination Theory (4FIT): Strategy, Methodology, & Anticipated Results, Measurement & Development of Narrative Imagination (NI), Identifying the Role of Simulation in Imagination Expertise, The Neurological Correlates of Creativity in Geniuses, Fantasy Orientation: Measuring Individual Differences, Improving Imaginative Play, & Assessing Mechanisms of Cognitive Development, The Benefits of Daydreaming for Creativity & Creative Writing, The School Imagination, Creativity, & Innovation (ICI) Index & Portfolio, Measuring Imagination with Functional Network Connectivity, Creativity & the Quantification of Free Thought, Transcranial Direct Current Stimulation to Enhance Creative Uses for Objects, Measuring & Improving Adolescents' Social-Emotional Imagination to Foster Flourishing: A Mixed- Method Neuroimaging & Psychosocial Longitudinal Study with School-Based Interventions, Structural & Functional Biomarkers of Aesthetic Creativity & Imagination, Self-Regulation in Creativity: The Difference Between Having an idea & Doing Something With It. In June 2017, we will gather all of our grant awardees for a symposium in Philadelphia where they will present their findings and publications to our team and the sponsor of this research.

On the Research Retreats: We gathered dozens of notable creative figures – psychologists, educators, futurists, physicists, comedians, neuroscientists, music composers, engineers, leadership, polymaths, and spiritual leaders to attend the retreats to discuss the role of imagination in their respective fields. For each event, we prepare a report and video footage highlights for general consumption on our website, http://imagination-institute.org/.

Prospective Psychology Stage 1: Imagination and Being Drawn into the Future and Prospective Psychology Stage 2: A Research Competition (Templeton Foundation, PI-Dr. Martin Seligman). These are two inter-linked new grants for the field of Prospective Psychology. These two 3-year grants will explore how people are drawn to the future as opposed to driven by the past. We will conduct foundational research on prospective thought, defined as mental and emotional representations of possible future events, hold conferences of leading scholars and award research grants through a competitive RFP process.

Positive Soldier Health (Robert Wood Johnson Foundation: PI-Dr. Martin Seligman). This 7-year project supports a collaboration between the University of Pennsylvania and the U.S. Army to explore, on a large scale, the influence of psychological and physical health assets on illness, health care utilization and health care expenditure. This project is enabled by an Army initiative that is integrating 40 different datasets, combining data on the health, illness, health care utilization and psychological fitness of all active-duty personnel – currently more than a million soldiers. The project will also create the infrastructure for a civilian-military collaboration that will enable researchers outside the military to analyze the dataset and to explore issues related to traditional health-risk factors. Deliverables will include 40 proof-of-concept cross-sectional analyses for the relationship of key health assets and health-risk factors to key utilization variables; 40 proof-of-concept longitudinal analyses for the relationship of health assets and health-risk factors as predictors of illness and utilization; establishment of a civilian-military steering committee to oversee the analyses and develop protocols, processes and resources to enable external researchers to use the database; initiation of at least five external research projects in each of Project Years 3 and 4; and a plan for sustainability.

Positive Health (Robert Wood Johnson Foundation: PI-Dr. Martin Seligman). This 4-year project lays the groundwork for a new approach to improving physical health that focuses on "health strengths," instead of the traditional emphasis on diagnosis, treatment and prevention of

disease. The premise is that health strengths are a buffer against physical and mental illness and, more importantly, that low-cost interventions can be designed to increase a person's health strengths. Such interventions could provide some low-cost options that improve health and reduce costs. The deliverables include (1) a formalized concept of Positive Health, (2) identification of variables that appear to be strong predictors of Positive Health, (3) a review of the relevant longitudinal studies that could be re-analyzed for Positive Health, (4) identification of interventions that could help people improve performance on those predictors, and (5) ideas for further development of the field.

Universal Assessment Research: Is the world good and does it matter? (Templeton Religion Trust, PI-Dr. Martin Seligman). We will explore how overall judgments of the world, termed "universal assessments" (UAs), affect human behavior and life outcomes. Key questions include: Which UA profiles are most conducive to wellbeing? Can interventions be administered? The goal of this project is to identify innovative, efficacious, and scaleable interventions which can be used to improve the human condition. In decades ahead, businesses, teachers, therapists, religious leaders, governments, and others may adopt practices promoting certain UAs. Parents may make conscious choices about which UAs they wish to pass on to children. Individuals will be able to take questionnaires to assess their UA profile, learn how it might be optimized, and discover how others' UAs influence them through the social network.

The Humanities and the Science of Well-Being: Toward a Strategic Collaboration for Understanding, Measuring, and Cultivating Human Flourishing (Templeton Religion Trust, PI-Pawelski). The purpose of this project is research to define, measure, and cultivate well-being in the humanities. There are three main activities: (1) research on the nature of the contemporary "positive turn" toward well-being and on the contributions the humanities might make in this endeavor, (2) the identification of leading scholars in the humanities, who believe in the importance of a strategic collaboration between these two domains for the study of well-being, and (3) the development of a large, multi-year, interdisciplinary grant proposal to launch such a strategic collaboration. Outputs include three peer-reviewed articles, a major entry in a standard reference work, six public lectures, a graduate course, a detailed listing of interested scholars in various disciplines, a planning meeting with some dozen key thought leaders, and a major grant proposal.

Allyson Mackey Research Summary: Our research seeks to explain and address inequities in educational outcomes. We use behavioral and neuroimaging methods to understand individual differences in brain plasticity and development, and aim to use this knowledge to inform the optimal type and timing of educational interventions.

Environmental Effects on Neurocognitive Development. Our prior work has linked low socioeconomic status (SES) to accelerated structural brain development in adolescence. In the past year, we have investigated links between SES and structural, and functional, brain development in early childhood. Lower SES is linked to thinner cortex in early-developing visual areas only, and not in the widespread areas we see in adolescence, suggesting that links between SES and cortical thickness spread as the brain develops (Leonard et al, 2019). Paradoxically, lower SES is associated with faster development of functional networks, both in early childhood (Tooley et al, in prep) and broadly across development (Tooley et al, 2019). We are investigating this apparent paradox by linking structural and functional measures, along with more specific environmental exposures, in large public developmental neuroimaging datasets.

SES is associated with a variety of specific environmental exposures that likely predict independent variance in neurocognitive development. In early childhood, experiencing stressful life events is associated with reduced connectivity between the amygdala and medial prefrontal cortex, and this reduced connectivity is associated with attention problems and aggression (Park et al, SCAN, 2018). Reduced language exposure (fewer conversational turns), is associated with reduced activity in Broca's area during a language comprehension task (Romeo et al, 2018), and with reduced organization of language-related white matter (Romeo et al, 2018). These neural signatures mediate relationships between language exposure and language ability.

We are currently collecting a dataset that includes a detailed array of environmental exposures, with a focus on cognitive enrichment, measures of brain structure and function, and measures of cognitive development. In parallel, we are conducting behavioral studies on the development of curiosity and creativity (Hart, Sorcher et al., in prep) in schools and museums.

Individual Differences in Frontoparietal Plasticity. We are working to capture individual differences in frontoparietal plasticity, and relate these differences to learning in the lab and in school. We have created a working memory training paradigm that is associated with reliable learning over the course of an hour, and have collected neuroimaging data before and after training. We are characterizing how short-term working memory gains are associated with reconfiguration of frontoparietal networks, and whether this reconfiguration will be bounded by structural measures such as myelin maps.

Self-Transcendent Experiences Research (David Yaden's Doctoral Research). Self-transcendent experiences are closely related to the religious, spiritual, and mystical experiences first described in William James's classic The Varieties of Religious Experience. While such experiences have often been assumed pathological, David's research provides evidence that they are prevalent in contemporary society and often have profoundly positive results for both believers and non-believers alike. His research aims to inform diagnostic categories in the DSM and to establish an epidemiology of self-transcendent experiences, including common triggers and outcomes, as well as their underlying neurobiological and cognitive mechanisms. Several articles that review empirical research on this topic and scales meant to measure these experiences have now been published. Brain stimulation and virtual reality studies have been completed and the data is being analyzed. David is now exploring further subjective features of these experiences, their intrinsic worth to those who have them, and their potential instrumental value in therapeutic contexts such as addiction. David continues to work on a book contracted by Oxford University Press on this topic.

Primal World Beliefs (Jeremy Clifton's Doctoral Research). Much of who the individual is and becomes in life (i.e., an array of personality, clinical, and well-being variables, including neuroticism, extraversion, optimism, curiosity, depression, life satisfaction, and so forth) may stem from unrecognized individual differences in perceived habitat-wide constraints, which we call primal world beliefs or primals. Primals include the belief that the world is dangerous and the belief that everything is interconnected. Whereas previous scholars have identified two primals, we have empirically identified twenty-six. Theory and correlational relationships suggests primals play a pervasive yet overlooked role in human life.

Situational Strategies for Self-Control (John F. Templeton Foundation, PI Angela Duckworth). Students who can resist momentarily rewarding temptations in the service of more enduringly valued goals excel academically. One fundamental question concerns the relative effectiveness of diverse self-control strategies for school-age children. In this project, we will

address the following hypotheses: 1. Situation selection and modification strategies increase self-controlled behavior more effectively than do cognitive strategies initiated later in the process of impulse generation. Situation selection and modification strategies diminish feelings of effort or distress relative to cognitive strategies3. The behavioral benefits of situation modification and selection are partially mediated by the less effortful phenomenology of these self-control strategies.

Performance Task Measures of Self-Control and Grit (Walton Family Foundation, PI Angela Duckworth). Our goal is to develop a suite of performance tasks assessing self-control and grit for middle school and high school students.

Character Development in Adolescence (Templeton Foundation, PI-Dr. Angela Duckworth). The primary aims of the project are: (1) to examine the impact of character strengths on academic success, social functioning, and psychological well-being; and (2) to examine potential interactions and overlap among character strengths. The primary measurement aims of the project are: (1) to develop age-appropriate, ecologically valid, teacher-report and self-report questionnaires assessing behavioral, cognitive, and motivational dimensions of these character strengths for use by both researchers and educational practitioners; (2) to create protocols and scoring rubrics for semi-structured interviews with adolescents about these strengths for use by researchers; (3) to examine evidence of reliability and construct validity (i.e., convergent, discriminant, and predictive validity) of newly developed questionnaires; and (4) in partnership with the Character Lab, to promote the use of valid measurement practices in the construction and evaluation of character development interventions.

Online Performance Tasks of Academic Diligence (University of Notre Dame, under a Templeton Foundation grant: PI-Dr. Angela Duckworth). The primary aim of this grant is to develop scaleable, online measures of academic diligence in a variety of domains. This involves rigorously piloting and revising novel tasks and culminates in a large-scale data collection in which we aim to validate these measures.

Building Grit via Online Interventions (Character Lab, PI-Dr. Angela Duckworth). This project has two primary aims: (1) to develop an online intervention that makes middle and high school students grittier, and (2) to develop a series of behavioral tasks that reliably measure grit. The proposed online intervention studies build upon a series of randomized-controlled interventions.

Character Counts: Development of a Character Growth Card (Character Lab, PI-Dr. Angela Duckworth). This project has three related aims: (1) to develop teacher-report and self-report questionnaires assessing character strengths in middle school students, (2) to establish evidence of these questionnaires' internal reliability, test-retest stability, convergent validity, discriminant validity, and predictive validity for a wide range of outcomes, and (3) to develop a format for reporting data from these questionnaires that makes salient to students changes in their character ratings over time and encourages them to set goals for improvement and plan for them.

Getting Grittier: Grit Curriculum & Professional Development for RBCS Elementary & Middle School (Mellon Family Foundation: PI-Dr. Duckworth). To meet the needs of students and families, RBCS plans to increase enrollment by 52%, from 485 to 730 students, and create a leading middle school serving grades 6 through 8. In addition to a rigorous core

academic curriculum, we believe that helping students build character will be essential to their long-term success. Educators and researchers agree that character strengths like "grit" are highly correlated with academic, social, health, and professional success. While the RBCS elementary school builds character through a myriad of activities, we plan to design a middle school that deliberately and systematically fosters grit and other essential character strengths in every student through an advisory model.

Self-Control Strategies in School-Age Children (Robert Wood Johnson Foundation: PI-Dr. Duckworth). The primary aim of this study is to examine self-control strategies in children, aimed to help them bypass immediately rewarding temptations for rival activities whose benefits accrue much later. This project will develop brief online interventions that teach self-control strategies to school-age children and adolescents, and test their effects on academic outcomes (e.g., homework completion, grades) and physical outcomes (e.g., healthy eating, physical activity).

Research Network on the Determinants of Life Course Capabilities and Outcomes (National Institute on Aging, PI Duckworth). The goal of this project is to better understand the underlying causes/sources of early inequality, how it affects individual capabilities later in life, and whether there are key times when intervention would improve capabilities.

Early Child Development Programs: Effective Interventions for Human Development (National Institute of Child Health and Human Development, Co-I Duckworth). This project promises substantial increases in knowledge of ECD by exploiting a rich new data set with a national representative longitudinal sample of 15,000 children initially 0-5y of age and their families with linked data that permit extensive characterization of the children and their family members and the ECD programs to which they have been exposed in Chile.

EDUCATION: GRADUATE AND UNDERGRADUATE

The Master of Applied Positive Psychology (MAPP). The MAPP program has completed its fourteenth year and this program has been successful in academic and financial terms. The number and quality of applicants and matriculates has been consistently high and the students have given the program high marks in their evaluations. Following are the number of applicants and admissions each year:

	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13
Applications	106	111	123	166	163	181	178	236
Admits	34	36	41	38	45	36	36	36

	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Applications	198	166	162	209	178	189	182
Admits	39	32	38	39	42	47	50(est.)

In line with the PPC's stated mission of promoting education, PPC faculty, post-doctoral fellows and graduate students teach the following undergraduate and graduate-level courses through the School of Arts and Sciences and the College of Liberal and Professional Education:

Martin Seligman
- MAPP 600: Intro to Positive Psychology (graduate level)

Angela Duckworth
- MAPP 601: Research Methods and Evaluation (graduate level)

Paul Rozin
- Session for MAPP (invited speaker)

Karen Reivich
- MAPP 708: Positive Psychology and Individuals (graduate level)

James Pawelski
- MAPP 602: Foundations of Positive Interventions (graduate level)
- MAPP 710: Humanities and Human Flourishing (graduate level)
- Psych 006: Pursuit of Happiness (undergraduate level)

Leona Brandwene
- MAPP 603: Perspectives on Well-being (graduate level)
- MAPP 714: Applying Positive Interventions in Institutions (graduate level)

Michael Baime
- MAPP 603: Approaches to Well-being (graduate level) – Guest Speaker

Judith Saltzberg
- MAPP 708: Positive Psychology and Individuals (graduate level)
- MAPP 800: Capstones (graduate level)

Scott Barry Kaufman
- Psychology 266-001: Introduction to Positive Psychology (undergraduate level)
- MAPP 712: Positive Education (graduate level) – Guest Speaker

David Yaden
- MAPP 600: Intro to Positive Psychology (graduate level) – Assistant Instructor
- MAPP 708: Positive Psychology and Individuals (graduate level) – Guest Speaker

Alejandro Adler
- MAPP 712: Positive Education (graduate level) – Guest Speaker

Laura Taylor
- MAPP 602: Foundations of Positive Interventions (graduate level) – Assistant Instructor
- MAPP 710: Humanities and Human Flourishing (graduate level) – Assistant Instructor
- Psych 006: Pursuit of Happiness (undergraduate level) – Lead TA

Lyle Ungar
- MAPP 600: Intro to Positive Psychology (graduate level) – Guest Speaker

RESILIENCE TRAINING PROGRAMS

Since 2007, we have delivered about 300 Penn Resilience Programs to more than 60,000 people. Many of these programs are train-the-trainer programs in which we train people how to teach resilience skills to others, using a structured curriculum. Attendees of these programs have gone on to teach these skills to more than a million people around the world.

These programs have been delivered to a variety of populations – educators (K-12 and college), U.S. Army soldiers, health care professionals, mental health professionals, police officers, a professional sports team, and corporate executives and their employees.

These training programs have been a success as judged by the participant satisfaction ratings and repeat contracts with sponsors. Participant satisfaction ratings for all our clients have been very good or excellent.

Here is a brief background on our resilience programs: Resilience is teachable. From 1990 to 2007, Dr. Martin Seligman and his colleagues, Dr. Jane Gillham, Dr. Karen Reivich, and Peter Schulman, received over $10 million dollars in a series of federal grants from the National Institute of Mental Health (NIMH) and the U.S. Department of Education to conduct research and development on resilience programs with three different populations – middle school students, high school students, and college students. This series of large scale, longitudinal, controlled studies showed that individuals who attended the resilience programs had significantly less depression, anxiety and conduct problems, and higher well-being and optimism than those in the control group. These empirical results have been published in peer-reviewed journal publications, documenting the benefits of these programs.

Drs. Seligman, Reivich, and Gillham are leaders in their fields. Dr. Seligman is well-known for his ground-breaking work in depression, helplessness, and Positive Psychology, and Dr. Reivich and Dr. Gillham are leaders in the field of depression prevention and school-based intervention research. The Penn Positive Psychology Center team has more than 25 years of experience developing and delivering resilience programs using a train-the-trainer model.

In 2007, we started offering our resilience programs as a fee-for-service. Our Director of Positive Psychology and Resilience Training, lead curriculum developer and head trainer, Dr. Karen Reivich, has led all aspects of this delivery and developed a large cadre of trainers to carry out these programs. This has enabled Penn to deliver many large-scale training programs.

RESEARCH PUBLICATIONS 2018-2019

Martin E.P. Seligman Publications:

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Book: Rashid, T. & Seligman, M. (2018). *Positive psychotherapy: Clinician manual*. N.Y.: Oxford University Press.

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Yaden, D. B., Eichstaedt, J. C., Medaglia, J. D. (2018). The future of technology in positive psychology: Methodological advances in the science of well-being. Frontiers.

Yaden, D. B., Meleis, M., Newberg, A. B., Vago, D. R., McDaniel, J. (2018). Cross-cultural contributions to psychology and neuroscience: Self, mind, and mindfulness in Buddhism. Pacific World, 3(19), 53-68.

Newberg, A. B., & Yaden, D. B. (2018). A Neurotheological Perspective on Altered States of Consciousness. *Journal of Consciousness Studies, 25*(11-12), 202-225.

Yaden, D. B. & Newberg, A. B. (2018). The interaction of religion and health. In Monti, D. A., Newberg, A. B., & Weil, A., (Eds.) Integrative Psychiatry and Brain Health. Oxford University Press.

Newberg, A. B. & Yaden, D. B. (2018). The Neurobiology of Meditation and Stress Reduction. In Monti, D. A., Newberg, A. B., & Weil, A., (Eds.) Integrative Psychiatry and Brain Health. Oxford University Press.

Chirco, A. & Yaden, D. B. (2018). Awe a self-transcendent and sometimes transformative emotion. In Lench, H. (Ed). The Function of Emotions (pp. 221-233), Springer.

Jeremy Clifton Publications:

Clifton, J. D. W. (in press). Happy in a 'shithole' world: The implications of primal world beliefs for increasing well-being through positive psychology interventions. *The Journal of Positive Psychology.*

Clifton, J. D. W., Baker, J. D., Park, C. L., Yaden, D. B., Clifton, A. B. W., Terni, P., Miller, J. L., Zeng, G., Giorgi, S., Schwartz, H. A., & Seligman, M. E. P. (2019). Primal world beliefs. *Psychological Assessment, 31*(1), 82-99. http://dx.doi.org/10.1037/pas0000639.

Oakerson, R. J., & Clifton, J. D. W. (2017). The Neighborhood as Commons: Reframing Neighborhood Decline. *Fordham Urban Law Journal, 44*, 411-450.

World Well-Being Project Research:

Li, M., Guntuku, S. C., Jakhetiya, V., & Ungar, L. H. (2019). *Exploring (dis-) similarities in emoji-emotion association on Twitter and Weibo.* Paper presented at the 2nd International Workshop on Emoji Understanding and Applications in Social Media, San Francisco, CA.

In this paper, we a) present a methodology to learn latent emotional components of Emojis, b) compare Emoji-Emotion associations across cultures, and c) discuss how they may reflect emotion expression in these platforms. Specifically, we learn vector space embeddings with more than 100 million posts from China (Sina Weibo) and the United States (Twitter), quantify the association of Emojis with 8 basic emotions, demonstrate correlation between visual cues and emotional valence, and discuss pairwise similarities between emotions.

Guntuku, S. C., Li, M., Tay, L., & Ungar, L. H. (2019). Studying cultural differences in emoji usage across the east and the west. *arXiv preprint arXiv:1904.02671*.

In this paper, using social media, we compare the Emoji usage based on frequency, context, and topic associations across countries in the East (China and Japan) and the West (United States, United Kingdom, and Canada). The analysis of Emoji use in the East and the West reveals recognizable normative and culture specific patterns. This research reveals the ways in which Emojis can be used for cross-cultural communication.

Guntuku, S. C., Preotiuc-Pietro, D., Eichstaedt, J. C., & Ungar, L. H. (2019). What twitter profile and posted images reveal about depression and anxiety. *arXiv preprint arXiv:1904.02670*.

In this study, we examine which attributes of profile and posted images are associated with depression and anxiety of Twitter users. Overall, we find that the image attributes that mark depression and anxiety offer a rich lens into these conditions largely congruent with the psychological literature, and that images on Twitter allow inferences about the mental health status of users.

Clifton, J. D., Baker, J. D., Park, C. L., Yaden, D. B., Clifton, A. B., Terni, P., Miller, J. L., Zeng, G., Giorgi, S., Schwartz, H. A., & Seligman, M. E. (2019). Primal world beliefs. *Psychological Assessment, 31*(1), 82.

In this paper, we introduce a set of environment beliefs, primal world beliefs or primals, that concern the world's overall character (e.g., the world is interesting, the world is dangerous), and create a measure called the 99-item Primals Inventory (PI-99). The PI-99 showed strong psychometric characteristics, primals plausibly shape many personality and well-being variables, and a broad research effort examining these relationships is warranted.

Eichstaedt, J. C., Smith, R. J., Merchant, R. M., Ungar, L. H., Crutchley, P., Preoţiuc-Pietro, D., Asch, D. A., & Schwartz, H. A. (2018). Facebook language predicts depression in medical records. *Proceedings of the National Academy of Sciences, 115*(44), 11203-11208.

In this article, we use language from Facebook posts of consenting individuals to predict depression recorded in electronic medical records. We found that language predictors of depression include emotional (sadness), interpersonal (loneliness, hostility), and cognitive (preoccupation with the self, rumination) processes.

Kulkarni, V., Kern, M. L., Stillwell, D., Kosinski, M., Matz, S., Ungar, L., Skiena, S., & Schwartz, H. A. (2018). Latent human traits in the language of social media: An open-vocabulary approach. *PloS one, 13*(11), e0201703.

In this paper, we study the process of inferring a new set of potential human traits based on unprompted language use on Facebook. We subject these new traits to a comprehensive set of evaluations and compare them with a popular five factor model of personality. We find that our language-based trait construct is often more generalizable in that it often predicts non-questionnaire-based outcomes better than questionnaire-based traits. Our approach

suggests a value in new constructs of personality derived from everyday human language use.

Rouhizadeh, M., Jaidka, K., Smith, L., Schwartz, H. A., Buffone, A., & Ungar, L. (2018). Identifying locus of control in social media language. In *Proceedings of the 2018 Conference on Empirical Methods in Natural Language Processing* (pp. 1146-1152).

We explore the roles of syntax and semantics in expressing users' sense of control –i.e. being "controlled by" or "in control of" their circumstances– in a corpus of annotated Facebook posts. We present rich insights into these linguistic aspects and find that while the language signaling control is easy to identify, it is more challenging to label it is internally or externally controlled, with lexical features outperforming syntactic features at the task. Our findings could have important implications for studying self-expression in social media.

Giorgi, S., Preotiuc-Pietro, D., Buffone, A., Rieman, D., Ungar, L. H., & Schwartz, H. A. (2018). The remarkable benefit of user-level aggregation for lexical-based population-level predictions. *arXiv preprint arXiv:1808.09600.*

This paper describes a simple yet effective method for building community-level models using Twitter language aggregated by user. Results on four different U.S. county-level tasks, spanning demographic, health, and psychological outcomes show large and consistent improvements in prediction accuracies over the standard approach of aggregating all tweets. We make our aggregated and anonymized community-level data available for research.

Buechel, S., Buffone, A., Slaff, B., Ungar, L., & Sedoc, J. (2018). Modeling empathy and distress in reaction to news stories. *arXiv preprint arXiv:1808.10399.*

This paper presents the first publicly available gold standard for empathy prediction. It is constructed using a novel annotation methodology which reliably captures empathy assessments by the writer of a statement using multi-item scales. This is also the first computational work distinguishing between multiple forms of empathy, empathic concern, and personal distress, as recognized throughout psychology.

Ebert, T., Eichstaedt, J. C., Lee, N., Obschonka, M., & Rodríguez-Pose, A. (2018). *Big Data, artificial intelligence and the geography of entrepreneurship in the United States* (No. 12949). CEPR Discussion Papers.

In this paper, we estimate the Big Five personality traits and an entrepreneurial personality profile for 1,772 U.S. counties using a machine learning model processing 1.5 billion tweets by 5.25 million users. We conclude that artificial intelligence methods, analyzing publically available social media data, are indeed able to detect entrepreneurial patterns, by measuring territorial differences in entrepreneurial personality/culture that are valid markers of actual entrepreneurial behavior.

Yaden, D. B., Eichstaedt, J. C., & Medaglia, J. D. (2018). The future of technology in positive psychology: Methodological advances in the science of well-being. *Frontiers in Psychology, 9*, 962.

This article reviews the technologies that we predict will have the most impact on both measurement and intervention in the field of positive psychology over the next decade. These technologies include: psychopharmacology, non-invasive brain stimulation, virtual reality environments, and big-data methods for large-scale multivariate analysis.

Schwartz, H. A., Giorgi, S., Kern, M. L., Park, G., Sap, M., Labarthe, D. R., Larson, E. E., Seligman, M. E., & Ungar, L. H. (2018). More evidence that Twitter language predicts heart disease: A response and replication. *arXiv preprint.*

This article is a response to a critique from Brown and Coyne of our 2015 article "Twitter Language Predicts Heart Disease Mortality," as well as a replication of that 2015 study. We find that (a) Twitter language still predicts county atherosclerotic heart disease mortality with the same accuracy, and (b) the specific dictionary correlations we reported are largely unchanged on the new data set.

Jaidka, K., Chhaya, N., & Ungar, L. (2018, July). Diachronic degradation of language models: Insights from social media. In *Proceedings of the 56th Annual Meeting of the Association for Computational Linguistics* (Volume 2: Short Papers) (pp. 195-200).

This study investigates the diachronic accuracy of pre-trained language models for downstream tasks in machine learning and user profiling. Our findings show that diachronic differences in language can be observed on social media and their effect differs for social media users of varying ages.

Zamani, M., Buffone, A., and Schwartz, H. A. (2018). Predicting human trustfulness from Facebook language. *Proceedings of the Fifth Workshop on Computational Linguistics and Clinical Psychology: From Keyboard to Clinic,* pp. 174-181, New Orleans, Louisiana.

We develop the first language-based assessment of the personality trait of trustfulness by fitting one's language to an accepted questionnaire-based trust score. Further, using trustfulness as a type of case study, we explore the role of questionnaire size as well as word count in developing language-based predictive models of users' psychological traits. We find that leveraging a longer questionnaire can yield greater test set accuracy, while, for training, we find it beneficial to include users who took smaller questionnaires which offers more observations for training.

Guntuku, S. C., Buffone, A., Jaidka, K., Eichstaedt, J., & Ungar, L. (2018). Understanding and measuring psychological stress using social media. *arXiv preprint arXiv:1811.07430.*

In this paper, we explore the language of psychological stress with a dataset of 601 social media users. Firstly, we find that stressed users post about exhaustion, losing control, increased self-focus and physical pain as compared to posts about breakfast, family-time, and travel by users who are not stressed. Secondly, we find that Facebook language is more predictive of stress than Twitter language. Thirdly, we demonstrate how the language based models thus developed can be adapted and be scaled to measure county-level trends. Fourthly, we find that domain-adapted and scaled social media-based measurements of stress outperform sociodemographic variables (age, gender, race, education, and income), against ground-truth survey-based stress measurements.

Guntuku, S. C., Giorgi, S., & Ungar, L. H. (2018, June). Current and future psychological health prediction using language and socio-demographics of children for the CLPysch 2018 shared task. Paper presented at the *Fifth Workshop on Computational Linguistics and Clinical Psychology: From Keyboard to Clinic*, New Orleans, LA.

The goal of this paper was to use childhood language as a marker for both current and future psychological health over individual lifetimes. Our findings indicate that misspellings, words with illegible letters and increased use of personal pronouns are correlated with poor mental health at age 11, while descriptions about future physical activity, family, and friends are correlated with good mental health.

Samani, Z. R., Guntuku, S. C., Moghaddam, M. E., Preoţiuc-Pietro, D., & Ungar, L. H. (2018). Cross-platform and cross-interaction study of user personality based on images on Twitter and Flickr. *PloS one*, *13*(7), e0198660.

In this study, we analyzed variation in image content with user personality across three interaction types (posts, likes and profile images) and two platforms, using a unique data set of users who are active on both Twitter and Flickr. Usage patterns on these two social media platforms revealed different aspects of users' personality. Cross-platform data fusion is thus shown to improve personality prediction performance.

Curtis, B., Giorgi, S., Buffone, A. E., Ungar, L. H., Ashford, R. D., Hemmons, J., Summers, D., Hamilton, C., & Schwartz, H. A. (2018). Can Twitter be used to predict county excessive alcohol consumption rates? *PloS one, 13*(4), e0194290.

This study analyzes a large set of Twitter data from 1,384 US counties to determine whether excessive alcohol consumption rates can be predicted by the words being posted from each county. We found that Twitter data can be used to predict public health concerns such as excessive drinking.

Zhu, Y., Guntuku, S. C., Lin, W., Ghinea, G., & Redi, J. A. (2018). Measuring individual video QoE: A survey, and proposal for future directions using social media. *ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM)*, *14*(2s), 30.

In this article, we develop (and open-source) a Facebook application, named YouQ[1], as an experimental platform for studying individual experience for videos. Our results show that subjective experiments based on YouQ can produce reliable results as compared to a controlled laboratory experiment.

Jaidka, K., Goyal, T., & Niyati, C. (2018). Predicting email and article click-throughs with domain-adaptive language models. In *Proceedings of the 10th ACM conference on Web Science*, pp. 177-184, Amsterdam, Netherlands.

In this study, we explore the differences in recipients' preferences for subject lines of marketing emails from different industries, in terms of their clickthrough rates. Different stylistic strategies of subject lines characterize high clickthroughs in different commercial verticals.

Jaidka, K., Buffone, A., Eichstaedt J., Rouhizadeh, M., & Ungar, L. (2018). Modeling and visualizing locus of control with Facebook language. In *Proceedings of the International AAAI Conference on Web and Social Media*, Palo Alto, CA.

In this study, we aim to bridge this gap between the computational and descriptive analyses of the language features with a visualization that situates the language associated with one psychological trait in the context of other psychological dimensions.

Jaidka, K., Guntuku, S. C., & Ungar, L. (2018). Facebook vs. Twitter: Differences in self-disclosure and trait prediction. In *Proceedings of the International AAAI Conference on Web and Social Media,* Palo Alto, CA.

This study compares self-disclosure on Facebook and Twitter through the lens of demographic and psychological traits. Predictive evaluation reveals that language models trained on Facebook posts are more accurate at predicting age, gender, stress, and empathy than those trained on Twitter posts. Facebook and Twitter are equally good at predicting user traits when the same-sized language samples are used to train language models.

Jaidka, K., Ahmed, S., Skoric, M., & Hilbert, M. (2018). Predicting elections from social media: a three-country, three-method comparative study. *Asian Journal of Communication, 29*(3), 252-273.

This study introduces and evaluates the robustness of different volumetric, sentiment, and social network approaches to predict the elections in three Asian countries -- Malaysia, India, and Pakistan from Twitter posts. We find that predictive power of social media performs well for India and Pakistan but is not effective for Malaysia.

In Press

Merchant, R. M., Asch, D. A., Crutchley, P., Ungar, L. H., Guntuku, S. C, Eichstaedt, J. C., Hill, S., Padrez, K., Smith, R. J., & Schwartz, H. A. (in press). Medical conditions are predictable from social media posts. *PLOS One.*

In this paper we demonstrate that a variety of medical conditions can be predicted using language from social media posts (i.e., Facebook and Twitter).

Pang, D., Eichstaedt, J. C., Buffone, A., Slaff, B., Ruch, W., & Ungar, L. H. (in press). The language of character strengths: Predicting morally valued traits on social media. *Journal of Personality*.

In this article, we demonstrate that language from social media posts (i.e., Facebook and Twitter) can predict morally valued traits assessed using the VIA character strengths survey.

Submitted

Matero, M., Idnani, A., Son, Y., Giorgi, S., Vu, H., Zamani, M., Limbachiya, P., Guntuku, S.C.,

& Schwartz, H. A. (2019). *Suicide risk assessment with multi-level dual-context language and BERT*. Paper to be presented at the Computational Linguistics and Clinical Psychology Workshop, Minneapolis, MN.

This paper examines naturalistic language from Reddit and assesses suicide risk using the cutting edge tools of multi-level dual-context language and bidirectional encoder representations from transformers (BERT).

Jaidka, K., Giorgi, S., Schwartz, H. A., Kern, M., Ungar, L., & Eichstaedt, J. C. (2019). *Measuring the well-being of US counties using Twitter: An empirical comparison of four approaches*. Manuscript submitted for publication.

In this paper, we compare four approaches of using naturalistic Twitter language to measure well-being in US counties.

Yaden, M. E., Yaden, D. B., Buffone, A. E. K., Eichstaedt, J. C., Crutchley, P., Smith, L., Cass, J. L., Callahan, C. A., Rosenthal, S., R., Ungar, L. H., Schwartz, H. A., & Hojat, M. (2019). *Linguistic analysis of empathy in medical school admission essays*. Manuscript submitted for publication.

In this article, we employ our methods of language analysis to examine the construct of empathy in medical school admission essays.

Eichstaedt, J. C., Yaden, D. B., Ribiero, F., & Kern, M. L. (2019). *Lifestyle and well-being: Exploring behavioral and demographic covariates in a large US sample*. Manuscript submitted for publication.

This article investigates the numerous behavioral and demographic covariates of lifestyle and well-being in a sample of individuals residing in the US.

Buffone, A., Giorgi, S., Jones, Yaden, D. B., J., Kern, P. K., Smith, L., Elstein, J., Kregor, J., P., Crutchley, Eichstaedt, J., Ungar, L., & Schwartz, H. A. (2018). *The state of trust in the US: Measuring generalized trust in individuals and regions using computational linguistic analysis*. Manuscript submitted for publication.

In this paper, we use computational linguistic analysis to assess the state of generalized trust across individuals and regions in the United States.

Eichstaedt, J. C. & Weidman, A. (2018). *Tracking fluctuations in psychological states: A case study of weekly emotion using social media language*. Manuscript submitted for publication.

This article utilizes naturalistic language use provided via social media posts (i.e., Facebook and Twitter) to assess fluctuations in the psychological states of individuals and thereby generate a case study of weekly emotion.

Eichstaedt, J. C., Kern, M. L., Tobolsky, V., Yaden, D. B., Schwartz, H. A., Park, G., Hagan, C. A., Smith, L. K., Buffone, A., Iwry, J., Ungar, L. H., & Seligman, M. E. P. (2018). *From hypothesis-testing to hypothesis-generation with text analysis: A review and quantitative*

comparison of open and closed-vocabulary approaches on a large facebook dataset. Manuscript submitted for publication.

In this paper, we compare two different methods of analyzing language from large Facebook datasets: the open versus closed vocabulary approaches.

Ahmed, S., Cho, J., Jaidka, K., Eichstaedt, J. C., & Ungar, L. (2018). *The Internet and participation inequality: A multi-level examination of 111 countries.* Manuscript submitted for publication.

This paper investigates the inequality of Internet access and participation across 111 countries through a multi-level examination.

Ressler, R. W., Paxton, P., Velasco, K., Pivnick, L., Weiss, I., & Eichstaedt, J. C. (2018). *Nonprofits, tweets and subjective well-being.* Manuscript submitted for publication.

In this article, we examine whether nonprofits improve the subjective well-being of communities by looking at Twitter language from within these communities.