

Positive Psychology Center Annual Report

May 23, 2017

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

New Books:

- In *Homo Prospectus*, Drs. Seligman, Railton, Baumeister, and Sripada argue that it is anticipating and evaluating future possibilities for the guidance of thought and action that is the cornerstone of human success. Though *sapiens* defines human beings as “wise”, what humans do especially well is to prospect the future. We are homo prospectus. Following is a recent New York Times article on this work:
<https://www.nytimes.com/2017/05/19/opinion/sunday/why-the-future-is-always-on-your-mind.html?action=click&contentCollection=Politics&module=Trending&version=Full®ion=Marginalia&pgtype=article&r=0>
- In *Being Called: Scientific, Secular, and Sacred Perspectives*, Drs. Yaden, McCall, and Ellens provide an essential resource for interdisciplinary research and scholarship on the phenomenon of feeling called to a life path or vocation at the interface of science and religion.
- 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.

New Research:

- **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 Soldier Health Grant (RWJF, PI-Seligman).** Research finding: Over a four-year period, catastrophic thinking is associated with a 24% increased risk of Post-Traumatic Stress Disorder (PTSD), per unit increase in catastrophic thinking. This association is robust and holds when adjusting for baseline depression, examining only soldiers who do not develop depression, assessing PTSD using self-reports rather than doctor diagnoses, and relying only on objective measures of combat stress. Submitted for publication.
- **Teaching Well-being Skills Improves Academic Performance (Ministries of Education in Bhutan, Mexico, and Peru).** As part of his doctoral research under the supervision of Dr. Martin Seligman, Dr. Alejandro Adler conducted three large-scale randomized controlled trials in a total of 782 secondary schools (grades 7-12) with a total of 771,300 students in three countries – Bhutan, Mexico and Peru. 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 after the intervention. These results suggest that, independent of social, economic, or cultural conditions, teaching well-being in schools on a large scale is both feasible and beneficial.

- **Learned Helplessness.** Learned helplessness, the failure to escape shock induced by uncontrollable aversive events, was discovered half a century ago. Seligman and Maier (1967) theorized that animals learned that outcomes were independent of their responses – that nothing they did mattered – and that this learning undermined trying to escape. The mechanism of learned helplessness has now been well-studied, and in this article Maier and Seligman revise their original theory: Passivity in response to shock is not learned, but rather the default response, and can be overcome by learning control. Reference: Maier, S. F., & Seligman, M. E. P. (2016). Learned helplessness at fifty: Insights from neuroscience. *Psychological Review*, 123, 349-367.
- **Situational Strategies for Self-Control.** Dr. Angela Duckworth (PI) received a 3-year grant from the John F. Templeton Foundation from September 2016 to August 2019.
- **Promoting Resilience in Post-Conflict Colombian Youth.** Dr. Alejandro Adler (PI) received a one-year research grant from the International Organization for Migration in Colombia from September 2016 to August 2017. The purpose of this research grant is 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.

New Resilience Training Contracts:

- **Cumulative Resilience Training Contracts.** Since 2007, we have delivered more than 270 Penn Resilience Programs to more than 45,000 people. Most 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 train more than half a million people, primarily school students and U.S. Army Soldiers.
- **Contracts for Resilience Training with the U.S. Army.** Since 2009, we have trained more than 45,000 soldiers who have in turn taught resilience skills to hundreds of thousands of other soldiers.
- **Resilience Training Contract with University of Texas System.** In 2016, we trained 180 educators how to teach the Penn Resilience Program to University of Texas students.
- **Resilience Training for New Clients.** We continue to develop new clients in new markets, including corporations (UAE corporate executives, Deloitte, Kimberly-Clark Professional) and professional sports. We also have new clients in existing markets, including education (St. Catherine’s School in Australia) and the U.S. Department of Defense (Learning & Development Division under the Office of the Secretary, Washington Headquarters Services; and Defense Technology Security Administration).
- **Resilience Training for Penn Employees.** In FY16 and FY17, we are delivering programs to:
 - **Division of Public Safety (DPS).** Approximately 170 DPS police officers and staff attended a one-day resilience program in FY16 (10 groups of about 17).
 - **Business Services Division (BSD).** Throughout FY17, we are delivering a three-day program for about 40 people on the leadership team, as well as a series of one-day programs for about 120 staff (3 groups of 40).

- **Division of Human Resources.** We are delivering one-day programs resilience programs for HR staff.
- **Wharton MBA Staff.** We delivered a one-day resilience program for about 50 Wharton MBA staff.

Outreach Programs:

- **The International Positive Education Network (IPEN).** IPEN was recently 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 has gained attention from over 159 countries and currently has thousands of members. IPEN hosted a large conference called the Festival of Positive Education in Dallas, Texas July 18-20, 2016. Some of the 800-1,000 members in attendance were from the United Nations, Organisation for Economic Cooperation and Development (OECD), and the Programme for International Student Assessment (PISA). <http://www.ipositive-education.net/>
- **Positive Psychology Lunch Series Talks.** In November of 2010, we initiated the Positive Psychology Lunch Series talks, which is held once or twice each month at the Positive Psychology Center (except the summer months), for the local psychology community. In the last 12 months, we had 11 speakers, including Dr. Barry Kerzin (Founder of the Altruism in Medicine Institute), and Dr. Deborah Small (Laura and John J. Pomerantz Professor of Marketing and Professor of Psychology at the Wharton School and the Psychology Department of the University of Pennsylvania). We also held a symposium on the Philosophy of Well-Being, which featured three talks by emerging philosophy scholars doing work at the intersection of philosophy and well-being, as well as special guest Dr. Dan Haybron, Professor of Philosophy at St. Louis University. Speakers are local or visiting scholars with research relevant to Positive Psychology. Attendance ranged from about 20 to 50 people for each event. Speakers also meet with interested faculty, post-doctoral fellows and graduate students. Some of the speakers are scholars from other Penn departments, to forge connections with these departments. These are low-cost talks, in which most speakers are local or visiting Philadelphia for other purposes. The non-local speakers receive travel reimbursement and typically no honorarium, though there are small honoraria in rare circumstances for the more distinguished scholars. These talks will continue in FY18.

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

Dr. Angela Duckworth's Research: Grit, Self-Control, and Character Development:

Lauri Bonacorsi, Research Coordinator
Lynette Bye, Research Coordinator
Lauren Eskreis-Winkler, Postdoctoral Fellow
Cameron French, Publishing Manager
Parker Goyer, Postdoctoral Fellow
Urvashi Gupta, Software Engineer
Kyla Haimovitz, Postdoctoral Fellow
Peter Meindl, Postdoctoral Fellow
David Meketon, Research Coordinator
Abigail Quirk, Research Coordinator
Ankur Saxena, Software Engineer
Sean Talamas, Director of Research

Dr. Angela Mackey's Research: Brain Plasticity and Development:

Jasmine Forde, Research Coordinator
Anne Park, Graduate Student
Katrina Simon, Research Coordinator
Ursula Tooley, Graduate Student

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
Sydney Rubin, Program Assistant Coordinator

Resilience and Positive Psychology Training Programs:

Karen Reivich, Ph.D., Director of Training Programs
Peter Schulman, New Business Development, Customer Service, Operations Oversight
Elizabeth Van Leer, Director of Operations
Margeaux Cannon, Program Manager
Mayra Marquez, Program Manager
Jennifer Knapp, Program Manager

Positive Soldier Health Grant:

Loryana Vie, Ph.D., Program Director
Andrew Allen, Statistical Analyst
Joseph Fisher, Statistical Analyst / Postdoctoral Fellow
Katya Giovannetti, Statistical Analyst
Emily Stewart, Statistical Analyst

Science of Imagination Research Grant:

Scott Barry Kaufman, Scientific Director
Elizabeth Hyde, Research Coordinator

World Well Being Research Grant:

Anneke Buffone, Lead Research Scientist / Postdoctoral Research Fellow
Johannes Eichstaedt, Graduate Student

Jeanette Elstein, Project Manager
Nicholas Fausti, Research Programmer
Salvatore Giorgi, Research Programmer
Shareth Chandra Guntuku, Postdoctoral Fellow
Kokil Jaidka, Postdoctoral Research Fellow
Jennifer Kregor, Project Manager
Phillip Lu, Research Programmer
Sphoorti Mirji, Web App Developer
Daniel Preotiuc-Pietro, Postdoctoral Fellow
Daniel Rieman, Research Programmer
Chris Tufts, Research Programmer

Well-Being Intervention Research:

Dr. Alejandro Adler, Postdoctoral Fellow

Graduate Students:

Jeremy Clifton (Ben Franklin Fellowship)
Johannes Eichstaedt
Xuan Gao
Anne Park
Ursula Tooley
David Yaden (Ben Franklin Fellowship)

Information Technology Support Staff:

Tammer Ibrahim, IT Systems Administrator
Samuel Wilkoff, IT Systems Support Specialist

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

PPC ADVISORY BOARD

The new advisory board for PPC and the MAPP program includes:

Larry Gladney

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:

- Mihaly 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 research projects at the Positive Psychology Center:

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 one-year research grant to revamp the existing 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 co-design a new Positive Education program to be implemented at The Shipley School. We will do post-implementation measurement nine months after introducing the new program at The Shipley School.

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 one-year research grant to conduct multi-level within and between subjects measurement 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 one-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, religiosity, 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 have gathered dozens of notable creative figures – psychologists, educators, futurists, physicists, comedians, neuroscientists, music composers, and engineers 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/>. We have three remaining retreats, focused on leadership, polymaths, and spirituality.

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.

Stress effects on neurocognitive development. Low socioeconomic status (SES) is associated with elevated stress levels. We are testing the novel hypothesis that a downstream consequence of high levels of stress is accelerated development, which brings with it reduced plasticity. We plan to use machine learning techniques to create models of "brain age" from measures of brain structure and function (Brown et al., 2012; Liem et al., 2017). We will calculate the difference between individuals' chronological ages and their predicted brain ages, and then link these offsets to stress exposure and cognition. We have gained access to several

large developmental neuroimaging databases with diverse stress measures and behavioral outcomes in order to begin these analyses.

Individual differences in frontoparietal plasticity. Frontoparietal networks support complex cognitive skills such as reasoning and problem solving. These networks develop slowly and are highly variable across individuals, suggesting that they are highly susceptible to environmental influence. In other words, they are highly plastic. Indeed, our previous research has shown plasticity in frontoparietal structure and function in adults (Mackey et al. 2012, 2013, 2015). We now want 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 plan to collect neuroimaging data before and after this learning. We predict that learning will be associated with reconfiguration of frontoparietal networks, and that this reconfiguration will be bounded by structural measures such as myelin maps (Glasser and Van Essen, 2011), as myelin is associated with reduced plasticity.

Intervention development. Our lab is also supporting small scale pilot studies of promising interventions to improve learning and mental health. We are evaluating diverse integrative programs such as visual arts, dance, and exploratory play for students from low income, high stress environments.

Positive Education in the Philippines: Educating for Academic Success and for Well-being (Quezon City Academy in Chile, PI Alejandro Adler). The purpose of this research grant is 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.

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. Short-term deliverables (1-2 years) include: 1) a theoretical article with providing robust definitions and the scientific foundations of studying such experiences, 2) an Oxford University press book updating James's *Varieties* for the 21st century, 3) a scale to measure awe and other self-transcendent experiences, 4) a suite of non-invasive brain stimulation studies on awe, 5) a suite of studies inducing awe with virtual reality, and 6) the beginnings of a theoretical inquiry into the fundamental faculties of consciousness that are altered during such experiences (i.e., time, space, self).

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. Further randomized-controlled grit-building interventions will be administered to students in schools across the U.S. beginning in September, 2013.

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 twelfth 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			
Applications	198	166	162	209	178			
Admits	39	32	38	39	42(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

- Psychology 70-001: Psychology of Food (undergraduate level)

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)

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 708: Positive Psychology and Individuals (graduate level) – Guest Speaker

Johannes Eichstaedt

- MAPP 600: Intro to Positive Psychology (graduate level) – Guest Speaker
- Psychology 001: Introduction to Experimental Psychology (undergraduate level) – Teaching Assistant

David Yaden

- MAPP 600: Intro to Positive Psychology (graduate level) – Assistant Instructor

Amy Walker Rebele

- MAPP 602: Foundations of Positive Interventions (graduate level) – Assistant Instructor
- MAPP 708: Positive Psychology and Individuals (graduate level) – Assistant Instructor

Alejandro Adler

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

RESILIENCE TRAINING PROGRAMS

Since 2007, we have delivered more than 270 Penn Resilience Programs around the world to more than 45,000 people. Many of these programs are train-the-trainer programs in which we train people how to teach the resilience skills to others, using a structured curriculum. Attendees of these programs have gone on to train hundreds of thousands of others, primarily school students and U.S. Army soldiers.

These resilience programs have been delivered to a variety of populations – educators (K-12 and college), U.S. Army soldiers, police officers, mental health professionals, senior leaders, corporations and a professional sports organization.

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 excellent, with average satisfaction ratings ranging from 4.5 to 5.0, on a 1 to 5 scale where 5 is best.

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 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 studies have been published in peer-reviewed journal publications, documenting the benefits of these programs. There have been at least 22 controlled studies with more than 2,000 children and adolescents.

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 service. Our Director of 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 2015-17

Martin E.P. Seligman Publications:

- Seligman, M. E. P., Cornum, R., Lester, P. B., Ho, T. E., Allen, A. R., Scheier, L. M., & Vie, L. L. (submitted). Catastrophic thinking predicts PTSD: From a new authoritative Army database. Manuscript submitted for publication.
- Diener, E., Seligman, M.E.P., Choi, H., & Oishi, S. (in press). Happiest people revisited: A worldwide examination. Perspectives on Psychological Science, 30th Year Anniversary Issue, Association for Psychological Science, invited article.

- Diener, E., & Seligman, M. E. P. (in press). Beyond money revisited: Progress on national accounts of well-being for policy. *Perspectives on Psychological Science*, 30th Year Anniversary Issue, Association for Psychological Science.
- Duckworth, A. L. & Seligman, M. (in press). The science and practice of self-control. *Perspectives on Psychological Science*.
- Seligman, M. E. P. Foreword. (2017) In M. Slade, L. Oades, & A. Jarden (Eds.) *Wellbeing, recovery and mental health*. New York, NY: Cambridge University Press.
- Adler, A. & Seligman, M. E. P. (2016) Using well-being for public policy: Theory, measurement, and recommendations. *International Journal of Well-being*, 6, 1-35.
- Greene, J., Morrison, I., & Seligman, M. (Eds.). (2016). *Positive Neuroscience*. N.Y.: Oxford University Press.
- Maier, S. F., & Seligman, M. E. P. (2016). Learned helplessness at fifty: Insights from neuroscience. *Psychological Review*, 123, 349-367.
- Ng, V., Cao, M., Marsh, H. W., Tay, L., & Seligman, M. E. P. (2016). The factor structure of the Values in Action Inventory of Strengths (VIAS-IS): An item-level exploratory structural equation modeling (ESEM) bifactor analysis. *Psychological Assessment*. Advance online publication.
- Park, G., Yaden, D. B., Schwartz, H. A., Kern, M. L., Eichstaedt, J. C., Kosinski, M., ... Seligman, M. E. P. (2016). Women are warmer but no less assertive than men: Gender and language on Facebook. *PloS one*, 11(5), e0155885. <http://dx.doi.org/10.1371/journal.pone.0155885>
- Roepke, A. M., & Seligman, M. E. P. (2016). Depression and prospection. *British Journal of Clinical Psychology*, 55, 23-48.
- Seligman, M. E. P., Railton, P., Baumeister, R. F., & Sripada, C. (2016). *Homo prospectus*. New York, NY: Oxford University Press.
- Schwartz, H. A., Sap, M., Kern, M. L., Eichstaedt, J. C., Kapelner, A., Agrawal, M., ... Ungar, L. H. (2016). Predicting individual well-being through the language of social media. *Pacific Symposium on Biocomputing*, 21, 516-527.
- Vie, L. L., Scheier, L. M., Lester, P. B., & Seligman, M. E. P. (2016). Initial validation of the U.S. Army Global Assessment Tool. *Military Psychology*, 28, 468-487.
- Seligman, M. (2015). Chris Peterson's unfinished masterwork: The real mental illnesses. *Journal of Positive Psychology: Special issue in memory of Chris Peterson*, 10(1), 3-6. doi:10.1080/17439760.2014.888582
- Roepke, A. M. & Seligman, M. E. P. (2015). Doors opening: A mechanism for growth after adversity. *Journal of Positive Psychology*, 10(2): 107-115, doi:10.1080/17439760.2014.913669
- Rashid, T., Summers, R. F. and Seligman, M. E. P. (2015) *Positive Psychology*. In A. Tasman, J. Kay, J. A. Lieberman, M. B. First and M. B. Riba (eds.) *Psychiatry*, fourth edition, John Wiley & Sons, Ltd, Chichester, UK. doi: 10.1002/9781118753378.ch30
- Seligman, M.E.P (2015). Preface. In Jeste, D.V. & Palmer, B.W. (Eds.) *Positive psychiatry: A clinical handbook*. Arlington, VA: American Psychiatric Publishing.
- Seligman, M.E.P. (2015) Foreword. In J. M. Norrish (author) *Positive education: The Geelong Grammar School journey* (pp. ix-xii). Oxford: Oxford University Press.
- Seligman, M. E. P. (2015). Introduction: How are we called into the future? In D. B. Yaden, T. D. McCall, & J. H. Ellens (Eds.), *Being called: Scientific, secular, and sacred perspectives* (xvii-xxvi). Santa Barbara, CA: Praeger.

Angela Duckworth Publications:

- D'Mello, S. K., Dieterle, E., & Duckworth, A. L. (2017). Advanced, Analytic, Automated (AAA) measurement of engagement during learning. *Educational Psychologist*, 52(2), 104-123.
- Duckworth, A. L. & Seligman, M. (in press). The science and practice of self-control. *Perspectives on Psychological Science*.
- Park, D., Tsukayama, E., Goodwin, G. P., Patrick, S., & Duckworth, A. L. (in press). A tripartite taxonomy of character: Evidence for intrapersonal, interpersonal, and intellectual competencies in children. *Contemporary Educational Psychology*.
- Eskreis-Winkler, L., Shulman, E. P., Young, V., Tsukayama, E., Brunwasser, S. M. & Duckworth, A. L. (2016). Using wise interventions to motivate deliberate practice. *Journal of Personality and Social Psychology*, 111(5), 728-744.
- West, M.R., Kraft, M.A., Finn, A.S., Martin, R., Duckworth, A.L., Gabrieli, C.F.O., & Gabrieli, J.D.E. (2016). Promise and paradox: Measuring students' non-cognitive skills and the impact of schooling. *Educational Evaluation and Policy Analysis*, 38(1), 148-170.
- Duckworth, A., Gendler, T., & Gross, J. (2016). Situational strategies for self-control. *Perspectives on Psychological Science*, 11, 35-55.
- Duckworth, A.L., White, R.E., Matteucci, A.J., & Gross, J.J. (2016). A stitch in time: Strategic self-control in high school and college students. *Journal of Educational Psychology*, 3, 329-341.
- Duckworth, A. L., Shulman, E. P., Mastrorarde, A. J., Patrick, S. D., Zhang, J., & Druckman, J. (2015). Will not want: Self-control rather than motivation explains the female advantage in report card grades. *Learning and Individual Differences*, 39, 13-23.
- Duckworth, A. L., Eichstaedt, J., & Ungar, L. (2015). The mechanics of human achievement. *Social and Personality Psychology Compass*, 9(7), 359-369.
- Duckworth, A.L., & Steinberg, L. (2015). Understanding and cultivating self-control in children and adolescents. *Child Development Perspectives*, 9(1), 32-37.
- Duckworth, A. L., & Yeager, D. S. (2015). Measurement matters: Assessing personal qualities other than cognitive ability for educational purposes. *Educational Researcher*, 44(4), 237-251.
- Galla, B.M. & Duckworth, A.L. (2015). More than resisting temptation: Beneficial habits mediate the relationship between self-control and positive life outcomes. *Journal of Personality and Social Psychology*. Advance online publication.
- White, R. E., Kross, E., & Duckworth, A. D. (2015). Spontaneous self-distancing and adaptive self-reflection across adolescence. *Child Development*, 86(4), 1272-1281.

Allyson Mackey Publications:

- Mackey AP, Park AT, Robinson ST, and Gabrieli JDE. (in press) A pilot study of classroom-based cognitive skill instruction: Effects on cognitive and academic performance. *Mind, Brain, and Education*.
- Cooper EA and Mackey AP (2016). Sensory and cognitive plasticity: implications for academic interventions. *Current Opinion in Behavioral Sciences*, 10: 21-27.
- Finn AS, Minas JE, Leonard JA, Mackey AP, Salvatore J, Goetz C, West MR, Gabrieli CFO and Gabrieli JDE (2016). Functional brain organization of working memory in adolescents varies in relation to family income and academic achievement. *Developmental Science*. doi: 10.1111/desc.12450.

- Mackey AP, Finn AS, Leonard JA, West MR, Gabrieli CFO, and Gabrieli JDE. (2015) Neuroanatomical correlates of the income achievement gap. *Psychological Science*, 26(6): 925–33.
- Mackey AP, Miller Singley AT, Wendelken JC and Bunge SA. (2015) Characterizing behavioral and brain changes associated with practicing reasoning skills. *PLOS ONE*. doi:10.1371/journal.pone.0137627.
- Leonard JA, Mackey AP, Finn AS, Gabrieli JDE. (2015) Differential effects of socioeconomic status on working and procedural memory systems. *Frontiers in Human Neuroscience*. 9(554).

Alejandro Adler Publications:

- Adler, A. & Seligman, M. E. P. (under review) Increasing well-being enhances academic performance in Bhutan.
- Adler, A. & Seligman, M. E. P. (under review) Well-being and academic achievement: A call for research action.
- Adler, A. (2016) "Teaching well-being increases academic performance: Evidence from Bhutan, Mexico, and Peru." Dissertations available from ProQuest. AAI10190088.
- Adler, A. & Seligman, M.E.P. (2016) Using well-being for public policy: Theory, measurement, and recommendations. *International Journal of Well-being*, 6(1), 1-35.
- Adler, A. (2016) Educación positiva: educando para el éxito académico y para la vida plena. *Papeles del Psicólogo*, (37)3, 50-57.
- Wagner, D., Buek, K.E., Adler, A., Castillo, N.M., Zahra, F.T., Lee, J., Chittamuru, D., & Lee, S. (2016), *Mind, Society, and Behavior* by World Bank. *Comparative Education Review*, 60(3), 601-604.
- Adler, A. (2016) Well-being Increases Academic Achievement. In White, M. A., Slemp, G. R., & Murray, S. (2016). *Future directions in wellbeing, positive education, and character education: A collection of essays*. Melbourne University Press: Australia.
- Kern, M., Waters, L., Adler, A., & White, M. A. (2015). A multifaceted approach to measuring wellbeing in students: Application of the PERMA framework. *Journal of Positive Psychology*, 10(3), 262-271.
- Kern, M. L., Adler, A., Waters, L. E., & White, M. A. (2015). Measuring Whole-School Well-being in Students and Staff. In *Evidence-Based Approaches in Positive Education* (pp. 65-91). Springer Netherlands.

David Yaden Publications:

- Book: Yaden, D. B., McCall, T. D., & Ellens, J. H. (Eds.) (2015). *Being called: Scientific, secular, and sacred perspectives*. Santa Barbara, CA: Praeger.
- Yaden, D. B., Le Nguyen, K., Park, G., Eichstaedt, J. C., Schwartz, H. A., Kern, M. L., Wintering, N., Waldman, M. R., Hood, R. W. Jr., Newberg, A. B. (2017). The noetic quality: A multi-method exploratory study. *Psychology of Consciousness: Theory, Research, and Practice*.
- Wurzman, R., Yaden, D. B. Giordano. (2016). Neuroscience fiction as eidola: On the neuroethical role and responsibilities in representation of neuroscience. *Cambridge Quarterly of Healthcare Ethics*.
- Chirico, A., Yaden, D. B., Riva, G., & Gaggioli, A. (2016). The potential of virtual reality for the investigation of awe. *Frontiers in Psychology*.

- Yaden, D. B., Iwry, J., Slack, K. J., Eichstaedt, J. C., Zhao, Y., Vaillant, G. E., & Newberg, A. B. (2016). The overview effect: Awe and self-transcendent experience in space flight. *Psychology of Consciousness: Theory, Research, and Practice*, 3(1), 1-11.
- Yaden, D. B., Le Nguyen, K. D., Kern, M. L., Belser, A. B., Eichstaedt, J. C., Iwry, J., Smith, M. E., Wintering, N. A., Hood, R. W., Newberg, A. B. (2016). Of roots and fruits: A comparison of psychedelic and non-psychedelic mystical experiences. *The Journal of Humanistic Psychology*.
- Park, G., Yaden, D. B., Schwartz, H. A., Kern, M. L., Eichstaedt, J. C., Kosinski, M., ... & Seligman, M.E.P. (2016). Women are Warmer but No Less Assertive than Men: Gender and Language on Facebook. *PLoS one*, 11(5), e0155885.
- Yaden, D. B., Eichstaedt, J. C., Schwartz, H. A., Kern, M. L., Le Nguyen, K., Wintering, N. A., Hood, R. W., Newberg, A. B. (2015). The language of ineffability: Linguistic analysis of mystical experiences. *Journal of Religion and Spirituality*.
- Newberg, A. B., Wintering, N. A., Waldman, M. R., Yaden, D. B., Alavi, A. (2015). A case series study of the neurophysiological effects of intense Islamic prayer. *Journal of Physiology, Paris*.

World Well-Being Project Research:

2017

- Sedoc J., Preotiuc-Pietro D. & Ungar, L. (2017). Predicting emotional word ratings using distributional representations and signed clustering. *Proceedings of the 14th Conference of the European Chapter of the Association for Computational Linguistics, EACL*.
- Yaden, D. B., Smith, L., Kern, M. L., Eichstaedt, J. C., Buffone, A. E. K., Stillwell, D. J., ... Schwartz, H. A. (in press). Language of religious affiliation: Social, emotional, and cognitive differences.
- Preotiuc-Pietro, D., Liu, Y., Hopkins, D., & Ungar, L. (in press). Beyond binary labels: Political ideology prediction of Twitter users. *Proceedings of the Annual Meeting of the Association for Computational Linguistics, 2017*.
- Guntuku, S. C., Yaden, D. B., Kern, M. L., Ungar, L. H., & Eichstaedt, J. C. (under review). Detecting depression and mental illness on social media: An integrative review. *Current Opinion in the Behavioral Sciences*.
- Guntuku, S.C., Lin, W., Carpenter, J., Ng, W.K, Ungar, L. & Preotiuc-Pietro D. (in press). Studying personality through the content of posted and liked images on Twitter. *Proceedings of the 9th International ACM Web Science Conference, Web Science 2017*.

2016

- Carpenter J., Crutchley, P., Zilca, R. D., Schwartz, H. A., Smith, L. K., Cobb, A. M., & Parks, A. C. (2016). Seeing the “big” picture: Big data methods for exploring relationships between usage, language, and outcome in internet intervention data. *Journal of Medical Internet Research*, 18(8):e241

In this article, we demonstrate how emerging big data approaches can help explore questions about the effectiveness and process of an online well-being intervention: Happify.

Flekova, L., Carpenter, J., Giorgi, S., Ungar, L., & Preotiuc-Pietro, D. (2016). Analyzing biases in human perception from user age and gender from text. Proceedings of the 54th Annual Meeting of the Association for Computational Linguistics, ACL.

In this paper, we conduct a large-scale crowdsourcing experiment on guessing age and gender from tweets. We identify textual cues that lead people to incorrectly identify traits, as well as cues that make raters more or less confident in their predictions.

Flekova, L., Ungar, L. & Preotiuc-Pietro, D. (2016). Exploring stylistic variation with age and income on Twitter. Proceedings of the 54th annual meeting of the Association for Computational Linguistics, ACL.

We explore the relation between stylistic and syntactic features and authors' age and income. We find that writing style is predictive of income even beyond age and analyze the predictive power of writing style in a large sample of Twitter users.

Fulgoni, D., Carpenter, J., Ungar, L., & Preotiuc-Pietro, D. (2016). An empirical exploration of moral foundations theory in partisan news sources. Proceedings of the 10th edition of the Language Resources and Evaluation Conference, LREC.

In this paper, we analyze text of articles from partisan news sources in the United States and highlight the words that different sources use. We use this data to predict the partisan bias of a news article, and explore the extent to which partisan news sources appeal to a set of five underlying morals: care, fairness, loyalty, authority, and security.

Ireland, M. E., Chen, Q., Schwartz, H. A., Ungar, L., & Albarracin, D. (2016). Action tweets linked to reduced county-level HIV prevalence in the United States: Online messages and structural determinants. *AIDS and Behavior*, 20, 1256-1264.

We correlated county-level HIV prevalence in the United States on action-oriented language (e.g., work, plan) in over 150 million tweets mapped to US counties. Controlling for demographic and structural predictors of HIV, more active language was associated with lower HIV rates. By leveraging language used on social media to improve existing predictive models of geographic variation in HIV, future targeted HIV-prevention interventions may have a better chance of reaching high-risk communities before outbreaks occur.

Kern, M. L., Park, G., Eichstaedt, J. C., Schwartz, H. A., Sap, M., Smith, L. K., & Ungar, L. H. (2016). Gaining insights from social media language: Methodologies and challenges. *Psychological Methods*, 21, 507-525.

Drawing on tools and techniques developed in natural language processing, we first introduce psychologists to social media language research, identifying descriptive and predictive analyses that language data allow. Second, we describe how raw language data can be accessed and quantified, and third, we highlight challenges and issues to be considered, including accessing and processing the data, interpreting effects, and ethical issues.

Liu, L., Preotiuc-Pietro, D., Samani, Z. R., Moghaddam, M. E., & Ungar, L. (2016). Analyzing personality through social media profile picture choice. Proceedings of the 10th International AAAI Conference on Web and Social Media, ICWSM.

We use a large Twitter dataset to discover how personality traits influence profile picture type. We study this using interpretable features such a color choice, aesthetic quality, composition, facial presentation and emotions.

Park, G., Schwartz, H. A., Sap, M., Kern, M. L., Weingarten, E., Eichstaedt, J. C., ... Seligman, M. E. P. (2016). Living in the past, present, and future: Measuring temporal orientation with language. *Journal of Personality*. Advance online publication.

We propose and evaluate a method for automatically measuring temporal orientation – individual differences in the emphasis one places on the past, present, or future – through language expressed on social media. We find that temporal orientation is correlate with age, gender, and Big Five personality traits.

Park, G., Yaden, D. B., Schwartz, H. A., Kern, M. L., Eichstaedt, J. C., Kosinski, M., ... Seligman, M. E. P. (2016). Women are warmer but no less assertive than men: Gender and language on Facebook. *PloS ONE*, 11(5), e0155885.

Using a large social media dataset and open-vocabulary methods from computational linguistics, we explored differences in language use across gender, affiliation, and assertiveness.

Preoțiu-Pietro D., Carpenter J., Giorgi S., & Ungar L. (2016). Studying the dark triad of personality through Twitter behavior. Proceedings of the 25th ACM Conference on Information and Knowledge Management, CIKM.

The dark triad - consisting of narcissism, psychopathy and Machiavellianism - represents the standard model of malevolent personality traits. Using a data-driven approach, we explore how the dark triad is related with observable Twitter behavior such as platform usage, posted text and profile image choice.

Preoțiu-Pietro, D., Xu, W., & Ungar, L. (2016). Discovering user attribute stylistic differences via paraphrasing. Proceedings of the Thirtieth AAAI Conference on Artificial Intelligence, AAAI.

In this study, we aim to find linguistic style distinctions across three different user attributes: gender, age and occupational class. By combining paraphrases with a simple yet effective method, we capture a wide set of stylistic differences that are exempt from topic bias.

Preoțiu-Pietro, D., Schwartz, H. A., Park, G., Eichstaedt, J., Kern, M., Ungar, L., & Shulman, E. P. (2016). Modelling valence and arousal in Facebook posts. Proceedings of the Workshop on Computational Approaches to Subjectivity, Sentiment and Social Media Analysis (WASSA), NAACL.

In this paper, we describe how we built a predictive model of valence (sentiment) and arousal (intensity) in expressions on social media.

Ranard, B.L., Werner, R.M., Antanavicius, T., Schwartz, H.A., Smith, R.J., Meisel, Z.F., Asch, D.A., Ungar, L.H. & Merchant, R.M. (2016). Yelp reviews of hospital care can supplement and inform traditional surveys of the patient experience of care. *Health Affairs*, 35, 697-705.

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 review on Yelp, suggesting that Yelp can help policy makers identify the measures of hospital quality that matter most to patients and caregivers.

Rouhizadeh, M., Ungar, L., Buffone, A. E. K., & Schwartz, H. A. (2016). Using syntactic and semantic context to explore psychodemographic differences in self-reference. The 2016 Conference on Empirical Methods in Natural Language Processing (EMNLP). Austin, TX.

In this paper we put "pronouns in their context," exploring the relationship between self-reference and age, gender, and depression depending on syntactic position and verbal governor.

Schwartz, H. A., Sap, M., Kern, M. L., Eichstaedt, J. C., Kapelner, A., Agrawal, M., ... Kosinski, M. (2016). Predicting individual well-being through the language of social media. *Biocomputing 2016: Proceedings of the Pacific Symposium* (pp. 516 - 527).

We present the task of predicting individual well-being, as measured by a life satisfaction scale, through the language people use on social media. Through crowd-sourced ratings of tweets and Facebook status updates, we create message-level predictive models for multiple components of well-being. However, well-being is ultimately attributed to people, so we perform an additional evaluation at the user-level.

Smith, L. K., Giorgi, S., Solanki, R., Eichstaedt, J. C., Schwartz, H. A., Abdul-Mageed, M., ..., Ungar, L. H. (2016). Does sentiment translate on Twitter? A comparative evaluation of English and Spanish well-being lexica. The 2016 Conference on Empirical Methods in Natural Language Processing (EMNLP). Austin, TX.

We investigate whether psychological well-being translates across English and Spanish Twitter, by building and comparing source language and automatically translated weighted lexica in English and Spanish. We find that the source language models perform substantially better than the machine translated versions.

Sinnenberg, L., DiSilvestro, C. L., Mancheno, C., Dailey, K., Tufts, C., Bottenheim, A. M., ... & Asch, D. A. (2016). Twitter as a potential data source for cardiovascular disease research. *JAMA Cardiology*, 1, 1032-1036.

As society is increasingly becoming more networked, researchers are beginning to explore how social media can be used to study person-to-person communication about health and

health care use. We describe the volume and content of Tweets associated with cardiovascular disease as well as the characteristics of Twitter users, and conclude that Twitter offers promise for studying public communications about cardiovascular disease.

2015

Eichstaedt, J. C. (2015). Big data and the world of social media: Lessons learned at the intersection of computer and psychological sciences. *APS Observer*.

In this article, Johannes Eichstaedt describes the current state and future directions of big data research using social media, and WWBP's pioneering role in advancing these methods.

Eichstaedt, J. C., Schwartz, H. A., Kern, M. L., Park, G., Labarthe, D. R., Merchant, R. M., ... Seligman, M. E. P (2015). Psychological language on Twitter predicts county-level heart disease mortality. *Psychological Science*, 26, 159-169.

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.

Flekova, L., Preotiuc-Pietro, D., Carpenter, J., Giorgi, S., & Ungar, L. (2015). Analyzing crowdsourced assessment of user traits through Twitter posts. *Proceedings of the Third AAAI Conference on Human Computation and Crowdsourcing. HCOMP*.

This preliminary study aims to gain a better understanding of which human attributes lead to better perceptions of the true identity of others.

Flekova, L., Ruppert, E., & Preotiuc-Pietro, D. (2015). Analysing domain suitability of a sentiment lexicon by identifying distributionally bipolar words. *Proceedings of the 6th Workshop on Computational Approaches to Subjectivity, Sentiment and Social Media Analysis*.

In this paper, we introduce a method which helps to identify frequent contexts in which a word switches polarity, and to reveal which words often appear in both positive and negative contexts.

Ireland, M. E., Schwartz, H. A., Chen, Q., Ungar, L., & Albarracin, D. (2015). Future-oriented tweets predict lower county-level HIV prevalence in the United States. *Health Psychology*, 34(S), 1252-1260.

This paper used over 150 million tweets mapped to US counties to demonstrate that counties with higher rates of future tense on Twitter had fewer HIV cases, independent of strong structural predictors of HIV, and that future orientation can buffer health risks.

Park, G., Schwartz, H. A., Eichstaedt, J. C., Kern, M. L., Kosinski, M., Stillwell, D. J., ... Seligman, M. E. P. (2015). Automatic personality assessment through social media language. *Journal of Personality and Social Psychology*, 108, 934-952.

We describe a personality assessment derived from an automated analysis of social media language. First, we build a model based on 66,000+ Facebook users and their personality traits, then we create a predictive model of personality based on their language. We find that language-based assessments can constitute valid personality measures: they agree with questionnaires and friend ratings, they can be combined with friend ratings to improve accuracy, they have expected correlations to relevant outcomes, and they are stable over six-month intervals.

Preoțiu-Pietro, D., Volkova, S., Lampos, V., Bachrach, Y., & Aletras, N. (2015) Studying user income through language, behaviour and affect in social media. *PLoS ONE* 10(9): e0138717.

This paper presents the first extensive study where user behaviour on Twitter is used to build a predictive model of income.

Preoțiu-Pietro, D., Sap, M., Schwartz, H. A., & Ungar, L. H. (2015). Mental illness detection at the World Well-Being Project for the CLPsych 2015 Shared Task. Proceedings of the Workshop on Computational Linguistics and Clinical Psychology: From Linguistic Signal to Clinical Reality, NAACL.

This article describes the submission of the World Well-Being Project in the 'CLPsych 2015' shared task, with a goal of automatically determining Twitter users who had self-reported having depression or PTSD. Our approach ranked second in all tasks on average precision and show best results at .1 false positive rates.

Preoțiu-Pietro, D., Eichstaedt, J., Park, G., Sap, M., Smith, L., Tobolsky, V., ... Ungar, L. H. (2015). The role of personality, age and gender in tweeting about mental illnesses. Proceedings of the Workshop on Computational Linguistics and Clinical Psychology: From Linguistic Signal to Clinical Reality, NAACL.

Our study focuses on personality and demographic influence in users tweeting about their mental illness: depression or post-traumatic stress disorder (PTSD).

Preoțiu-Pietro, D., Lampos, V., & Aletras, N. (2015). An analysis of the user occupational class through Twitter content. Proceedings of the 53rd annual meeting of the Association for Computational Linguistics, ACL.

We explore the dynamics of social media information in the task of inferring the occupational class of users. Our analysis is based on the Standard Occupational Classification from the Office of National Statistics in the UK, which encloses 9 extensive categories of occupations.

Schwartz, H. A., & Ungar, L. H. (2015). Data-driven content analysis of social media: A systematic overview of automated methods. *The ANNALS of the American Academy of Political and Social Science*, 659, 78-94.

We describe a range of automatic and partially automatic content analysis techniques and illustrate how their use on social media generates insights into subjective well-being, health, gender differences, and personality.

Schwartz, H. A., Park, G., Sap, M., Weingarten, E., Eichstaedt, J., Kern, M., ... Ungar, L. (2015). Extracting human temporal orientation from Facebook language. *NAACL HLT 2015: Conference of the North American Chapter of the Association for Computational Linguistics - Human Language Technologies*.

In this paper, we develop a novel behavior-based assessment of temporal orientation – how often individuals emphasize the past, present, and future – using human language on Facebook.

Weeg, C., Schwartz, H. A., Hill, S., Merchant, R. M., Arango, C., & Ungar, L. (2015). Using Twitter to measure public discussion of diseases: A case study. *JMIR Public Health Surveill*, 1(1):e6.

In this article we demonstrate that Twitter is a potentially useful tool to measure public interest in and concerns about different diseases, but when comparing diseases, improvements can be made by adjusting for population demographics and word ambiguity.

Yaden, D. B., Eichstaedt, J. C., Schwartz, H. A., Kern, M. L., Le Nguyen, K., Wintering, N. A., ..., Newberg, A. B. (2015). The language of ineffability: Linguistic analysis of mystical experiences. *Journal of Religion and Spirituality*, 8, 244-252.

In this article, we show that the most impactful mystical experiences are characterized by inclusive language, suggestive of a union between self and other.

In Press

Carpenter, J., Preotiuc-Pietro, D., Flekova, L., Giorgi, S., Hagan, C., Kern, M. L., ... Seligman, M. E. P. (2016). Real men don't say "cute": Using Automatic language analysis to isolate inaccurate aspects of stereotypes. *Social Psychological and Personality Science*. Advance online publication.

People draw conclusions about us, from our gender to education level, based on the words we use on social media. We analyzed the accuracy of those inferences based on publicly available tweets and isolated the stereotypes people used to categorize people across gender, age, education level, and political orientation. The results show that stereotypes and the truth often aligned, with people making accurate assumptions more than two-thirds of the time. However, inaccurate characterizations still showed up with inaccurate stereotypes tending to be exaggerated rather than backwards.

Yaden, D. B., Le Nguyen, K. D., Kern, M. L., Wintering, N. A., Eichstaedt, J. C., Schwartz, H. A., ... Newberg, A. B. (in press). The noetic quality: A multimethod exploratory study. *Psychology of Consciousness: Theory, Research, and Practice*.

Religious, spiritual, and mystical experiences (RSMs) are often described as having a noetic quality, or the compelling sense that the experience feels “real.” In this study, participants completed questions about the subjective qualities of their RSMs, reported the impact of their RSMs on various life domains, and provided written descriptions of their experiences for quantitative linguistic analysis.

Sedoc J., Preotiuc-Pietro D. & Ungar, L. (2017). Predicting emotional word ratings using distributional representations and signed clustering. *Proceedings of the 14th Conference of the European Chapter of the Association for Computational Linguistics, EACL*.

We develop a method for predicting affect word-ratings (valence and arousal) from a small rated set of words using distributional word representations and signed spectral clustering that achieves state-of-the-art results across three different languages (English, Spanish, Dutch).

Submitted

Abdul-Mageed, M., Buffone, A. E. K., Peng, H., Giorgi, S., Eichstaedt, J., & Ungar, L. (under review). I know how you feel: Measuring and characterizing types of empathy in social media.

Guntuku S.C. , Carpentar J., Lin W., Ungar L., Preotiuc-Pietro D. (under review). Studying personality through posted image content.

We study the type of image content posted on Twitter by users based on their Big Five personality traits.

Hagan C., Carpenter J., Ungar, L. & Preotiuc-Pietro D. (under review). Personality profiles of users sharing animal-related content on social media.

We use automatic text and image analysis to identify the relationship between the personality of the users posting about dogs, cats or neither.

Preotiuc-Pietro, D., Liu, Y., Hopkins, D. & Ungar, L. (under review). Beyond binary labels: Political ideology prediction of Twitter users.

We introduce the problem of political ideology prediction measured using a seven-point scale. We develop a predictive model of ideology from text which allows to uncover politically moderate and neutral users.

Preotiuc-Pietro, D. & Ungar, L. (under review). Developing user-level race and ethnicity predictors from Twitter text.

We develop and release user-level predictive models of the four major race/ethnicity groups in the US (Non-Hispanic White, African-American, Hispanic/Latino, Asian) based on their language use on Twitter.

Preotiuc-Pietro, D., Liu, L. & Ungar, L. (under review). Demographic differences in image posting on Twitter.

We study the type of image content posted on Twitter and used in profile images by users based on their different demographic traits (age, gender, education level, income level, religiosity) and build a predictive model of user demographics from the images they post.

Preotiuc-Pietro, D., Guntuku, S. C. & Ungar, L. (under review). Controlling human perception of basic user traits.

We study the extent to which human perception of basic user traits (age and gender) of other users from text can be controlled through automatic selection of content posted by the respective user and show this is feasible to some extent.

Yaden, D. B., Smith, L., Kern, M. L., Eichstaedt, J. C., Buffone, A. E. K., Stillwell, D. J., ... Schwartz, H. A. (under review). Language of religious affiliation: Social, emotional, and cognitive differences.

Using methods from computational linguistics, we examined the words and phrases from thousands of Facebook users in the US and UK who indicated their religious affiliation. Religious individuals used more positive emotion words and social themes, while non-religious people used more negative emotion words and themes related to cognitive processes.