

Penn Positive Psychology Center Annual Report

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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 Book Releases:

- In *The Hope Circuit*, Dr. Seligman looks at the history of his life and the field of psychology, and paints a much brighter future for everyone.
- In *Happy Together*, Dr. James Pawelski and Suzann Pileggi Pawelski apply the principles of positive psychology to create thriving romantic relationships, based on extensive scientific research.
- 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.

New Resilience Training Contracts:

- **Resilience Training Contracts.** Since 2007, we have delivered more than 270 Penn Resilience Programs to more than 50,000 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 roughly a million people, largely school students and U.S. Army Soldiers.
- **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 (PI: Seligman), 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 governmental organizations (World Bank), corporations (Delta Galil, Oklahoma City Thunder NBA team, the NFL/NCAA, Deloitte), education (Milken Community Schools, UK public schools), law enforcement (Pennsylvania State Police), and governmental organizations (World Bank; U.S. Department of Defense, Learning & Development Division under the Office of the Secretary, Washington Headquarters Services).
- **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.
 - Penn Office of Audit, Compliance, and Privacy (Greg Pellicano). For staff.
 - Penn School of Social Policy and Practice (Regine Metellus): For staff.
 - Wharton Executive Education Program (Patricia Parker). For NFL and NCAA personnel, as part of Wharton’s Athlete Development Professional Certification Program.
 - Penn School of Medicine (Lisa Bellini). For faculty and physicians.
 - Penn Athletics (Angel Prinos): For coaches.
- See more resilience programs under **Training Contracts** below.

Outreach Programs:

- **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 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 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 FY19.
- **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

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, Program Manager

Brittney Schlechter, Curriculum Development Manager
Judy Saltzberg, Ph.D., Instructor and Curriculum Developer

Positive Soldier Health Grant:

Loryana Vie, Ph.D., Program Director
Andrew Allen, Statistical Analyst
Whitney Kelley, 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, 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
Abigail Quirk, Research Coordinator
Priya Shankar, Research Coordinator
Sean Talamas, Director of Research

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 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:

- 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:

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, 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 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, submitted). 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, in prep). 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, submitted). 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.

Intervention Development. This year, we have been focusing on developing interventions to improve cognitive enrichment for children from low SES environments. We are working with a company that makes play-based science projects to customize our intervention, which will begin this summer. We have also developed a dance-based intervention for college students who are struggling with depression. An initial pilot study showed reductions in perceived stress and depression symptomology following a 6 week dance course (Robinson et al, in prep).

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).

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 wellbeing variables, including neuroticism, extraversion, optimism, curiosity, depression, life satisfaction, and so forth) stems from unrecognized individual differences in perceived habitat-wide constraints, i.e., *primal world beliefs* or *primals*). Whereas previous scholars have identified two primals, we have systematically identified twenty-six. Moreover, the pattern of 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. 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	2018/19		
Applications	198	166	162	209	178	189		
Admits	39	32	38	39	42(est.)	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

- 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)

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

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

Alejandro Adler

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

RESILIENCE TRAINING PROGRAMS

Since 2007, we have delivered more than 270 Penn Resilience Programs around the world to more than 50,000 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 about a million people, largely school students and U.S. Army soldiers.

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, 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, with average satisfaction ratings consistent 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 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 2016-2018

Martin E.P. Seligman Publications:

- Seligman, M. E. P. & Adler, A. (2018). Positive Education 2018. In Global Happiness Council (Eds.), *Global Happiness Report 2018*. New York: United Nations Sustainable Development Solutions Network.
- Shrestha, A., Cornum, R., Vie, L. L., Scheier, L. M., Lester, P. B., & Seligman, M. E. P. (2018). Protective effects of psychological strengths against psychiatric disorders among soldiers. *Military Medicine*, 183, 386-395.
- Diener, E., & Seligman, M. E. P. (2018). Beyond money revisited: Progress on national accounts of well-being for policy. *Perspectives on Psychological Science*, 30th Year Anniversary Issue, Association for Psychological Science, 13, 171-175.
- Diener, E., Seligman, M. E. P., Choi, H., & Oishi, S. (2018). Happiest people revisited: A worldwide examination. *Perspectives on Psychological Science*, 30th Year Anniversary Issue, Association for Psychological Science, 13, 176-184.

- Seligman, M. E. P., Allen, A. R., Scheier, L. M., Vie, L. L., Ho, T. E., Lester, P. B., & Cornum, R. (2018). Catastrophic thinking predicts PTSD: From a new authoritative Army database. Manuscript submitted for publication.
- Rashid, T., & Seligman, M. E. P. (2018). Positive Psychotherapy. In D. Wedding & R. J. Corsini (Eds.), *Current Psychotherapies* (pp. 481-526). Belmont, CA: Cengage.
- Seligman, M. E. P. (2018). PERMA and the building blocks of well-being. *Journal of Positive Psychology*. <https://doi.org/10.1080/17439760.2018.1437466>
- Kubzansky, L.D., Huffman, J.C., Boehm, J.K., Hernandez, R., Kim, E.S., Kikuchi, H., Feig, E.H., Lloyd-Jones, D.M., Seligman M.E.P., & Labarthe, D. (under review). Positive Psychological Well-Being and Cardiovascular Health Promotion. *Journal of American College of Cardiology*.
- Seligman, M.E.P. (in press). Positive psychology: A personal history. *Annual Review of Clinical Psychology*.
- Hassett, A. L., Fisher, J. A., Vie, L. L., Kelley, W. L., Clauw, D. J., & Seligman, M. E. P. (2018). Protective Effects of Optimism on Onset of Post-Deployment Pain in U.S. Army Personnel. Manuscript undergoing an Army security review.
- Adler, A., Unanue, W., Osin, E., Ricard, M., Alkire, S., & Seligman, M.E.P. (2017). Psychological Wellbeing. In *Happiness: Transforming the Development Landscape*, The Center for Bhutan Studies and GNH: Bhutan, 118.
- Adler, A., Boniwell, I., Gibson, E., Metz, T., Seligman, M.E.P., Uchida, Y., & Xing, Z. (2017). Definitions of terms. In *Happiness: Transforming the Development Landscape*, The Center for Bhutan Studies and GNH: Bhutan, 21.
- Bott, D., Escamillia, H., Kaufman, S., Kern, M., Krekel, C., Schlicht-Schmalzle, R., Seldon, A., Seligman, M., & White, M., (2017). The state of positive education. In E. E. Larson (Ed.). Report prepared for World Government Summit, Dubai: UAE.
- Park, G., Schwartz, H. A., Sap, M., Kern, M. L., Weingarten, E., Eichstaedt, J. C., ... Seligman, M. E. (2017). Living in the past, present, and future: Measuring temporal orientation with language. *Journal of Personality*, 85, 270-280.
- 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.
- Yaden, D. B., Eichstaedt, J. C., Kern, M., Smith, L., Buffone, A. E. K., Stillwell, D., Kosinski, M., Ungar, L. H., Seligman, M. E. P., & Schwartz, H. A. (2017). Language of religious affiliation: Social, emotional, and cognitive differences. *Social Psychological and Personality Science*, 1-9.
- Carpenter, J., Preotiuc-Pietro, D., Flekova, L., Giorgi, S., Hagan, C., Kern, M. L., & Seligman, M. E. P. (2017). Real men don't say "cute": Using automatic language analysis to isolate inaccurate aspects of stereotypes. *Social Psychological and Personality Science*, 8, 310-322.
- Buffone, A. E. K., Schwartz, H. A., Crutchley, P., Giorgi, S., Zamani, M., Elstein, J. G., & Seligman, M. E. P. (under review). Measuring trust through large-scale language analysis of social media: Trust as an aspect of individuals and communities. *Journal of Personality and Social Psychology*.
- Duckworth, A. L. & Seligman, M. (2017). The science and practice of self-control. *Perspectives on Psychological Science*, 12 (5), 715-718.
- Seligman, M. (2016). How positive psychology happened and where it is going. In R. Sternberg, S. Fiske, & D. Foss (Eds). *Scientists making a difference*. Cambridge: Cambridge 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.
- Roepke, A. M., & Seligman, M. E. P. (2016). Depression and prospection. *British Journal of Clinical Psychology*, 55, 23-48.
- 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.
- 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>
- Maier, S. F., & Seligman, M. E. P. (2016). Learned helplessness at fifty: Insights from neuroscience. *Psychological Review*, 123, 349-367.
- Vie, L. L., Scheier, L. M., Lester, P. B., & Seligman, M. E. P. (2016). Initial validation of the US Army Global Assessment Tool. *Military Psychology*, 28, 468-487.
- 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.

Angela Duckworth Publications:

- Duckworth, A. L., Taxer, J., Eskreis-Winkler, L., Galla, B. M., & Gross, J. J. (in press). Self-control and academic achievement. *Annual Review of Psychology*.
- Hutt, S., Gardner, M., Kamentz, D., Duckworth, A. L., & D'Mello, S. K. (in press). Prospectively predicting 4-year college graduation from student applications. In S. Buckingham Shum, R. Ferguson, A. Merceron, & X. Ochoa (Eds.). *Proceedings of the 8th International Learning Analytics and Knowledge Conference (LAK '18)*. ACM: New York, NY.
- Robinson, C. D., Pons, G., Duckworth, A. L. & Rogers, T. (2018). Some middle school students want behavior commitment devices (but take-up does not affect their behavior). *Frontiers in Psychology*, 9(206).
- 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. (2017). The science and practice of self-control. *Perspectives on Psychological Science*, 12(5), 715–718.
- Park, D., Tsukayama, E., Goodwin, G. P., Patrick, S., & Duckworth, A. L. (2017). A tripartite taxonomy of character: Evidence for intrapersonal, interpersonal, and intellectual competencies in children. *Contemporary Educational Psychology*, 48(2017), 16–27.
- Park, D., Yu, A., Metz, S. E., Tsukayama, E., Crum, A., & Duckworth, A. L. (2017). Beliefs about stress attenuate the relation among adverse life events, perceived distress, and self-control. *Child Development*.
- Wiese, C. W., Tay, L., Duckworth, A. L., D'Mello, S., Kuykendall, L., Hofmann, W., Baumeister, R. F., & Vohs, K. D. (2017). Too much of a good thing? Exploring the inverted-U relationship between self-control and happiness. *Journal of Personality*.
- 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.
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- Galla, B. M., Baelen, R. N., Duckworth, A. L., & Baime, M. J. (2016). Mindfulness, meet self-regulation: Boosting out-of-class meditation practice with brief action plans. *Motivation Science*, 2(4), 220-237.
- 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.
- Yeager, D. S., Walton, G. M., Brady, S. T., Akcinar, E. N., Paunesku, D., Keane, L., Kamentz, D., Ritter, G., Duckworth, A. L., Urstein, R., Gomez, E. M., Markus, H. R., Cohen, G. L., & Dweck, C. S. (2016). Teaching a lay theory before college narrows achievement gaps at scale. *Proceedings of the National Academy of Sciences*, 113(24), E3341–E3348.

Allyson Mackey Publications:

- Park A.T., Leonard J.A., Saxler P., Cyr A.B., Gabrieli J.D.E, Mackey A.P. (2018) Amygdala-medial prefrontal functional connectivity relates to stress exposure and mental health in early childhood. *Social Cognitive and Affective Neuroscience*.
- Romeo, R. R., Leonard, J. A., Robinson, S. T., West, M. R., Mackey, A. P., Rowe, M. L., & Gabrieli, J. D. E. (2018). Beyond the 30-Million-Word Gap: Children’s Conversational Exposure Is Associated With Language-Related Brain Function. *Psychological Science*.
- Mackey, A. P., Park, A. T., Robinson, S. T., & Gabrieli, J. D. E. (2017). A Pilot Study of Classroom-Based Cognitive Skill Instruction: Effects on Cognition and Academic Performance. *Mind, Brain and Education: The Official Journal of the International Mind, Brain, and Education Society*, 11(2), 85–95.
- Cooper, E. A., & Mackey, A. P. (2016). Sensory and cognitive plasticity: implications for academic interventions. *Current Opinion in Behavioral Sciences*, 10, 21–27.
- Finn, A. S., Minas, J. E., Leonard, J. A., Mackey, A. P., Salvatore, J., Goetz, C., ... Gabrieli, J. D. E. (2016). Functional brain organization of working memory in adolescents varies in relation to family income and academic achievement. *Developmental Science*.
<https://doi.org/10.1111/desc.12450>

Alejandro Adler Publications:

- Adler, A. & Seligman, M. E. P. (under review) Increasing well-being enhances academic performance: Evidence from Bhutan, Mexico, and Peru.
- Adler, A. & Seligman, M. E. P. (under review) Well-being and academic achievement: A call for research action.
- Seligman, M. E. P. & Adler, A. (2018). Positive Education. In the Global Happiness Council (Eds.), *Global Happiness Policy Report 2018*. New York: Sustainable Development Solutions Network. ISBN 978-0-9968513-7-4
- Adler, A., Unanue, W., Osin, E., Ricard, M., Alkire, S., & Seligman, M.E.P. (2017). Psychological Wellbeing. *Happiness: Transforming the Development Landscape*, The Center for Bhutan Studies and GNH: Bhutan, 118.

- Adler, A., Boniwell, I., Gibson, E., Metz, T., Seligman, M.E.P., Uchida, Y., & Xing, Z. (2017). Definitions of terms. *Happiness: Transforming the Development Landscape*, The Center for Bhutan Studies and GNH: Bhutan, 21.
- Adler, A. & Seligman, M.E.P. (2017) "Student Well-Being." *The Education 2030 Conceptual Learning Framework: A Tool to Build Common Understandings of Complex Concepts*. OECD Publishing, Paris.
- Adler, A. (2017) "Educación positiva: educando para el éxito académico y para la vida plena." *Papeles del Psicólogo*, (38)1.
- 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.
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- 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., Zhao, Y., Peng, K., Newberg, A. B. (Eds.). (under review). *Rituals and Practices in World Religions*. Springer.
- 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., Kaufman, S. B., Hyde, E., Chirico, A., Gaggioli, A., Zhang, J. W., Keltner, D. (in press). The development of the awe experience scale (AWE-S): A multifactorial measure for a complex emotion. *Journal of Positive Psychology*.
- Yaden, D. B., Eichstaedt, J. C., Medaglia, J. D. (in press). 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.
- Yaden, D. B., Haidt, J., Hood, R., Vago, D., & Newberg, A. B. (2017). The varieties of self-transcendent experience. *Review of General Psychology*, 21(2), 143-160.
- Yaden, D. B., Smith, L., Kern, M. L., Eichstaedt, J. C., Buffone, A. E. K., Stillwell, D. J., Kosinski, M., Ungar, L. H., Seligman, M. E. P., Schwartz, H. A. (2017). The language of religious affiliation: Social, emotional, and cognitive differences. *Social Psychological and Personality Science*.

- Guntuku, S. C., Yaden, D. B., Kern, M. L., Ungar, L. H., & Eichstaedt, J. C. (2017). Detecting depression and mental illness on social media: an integrative review. *Current Opinion in Behavioral Sciences*, 18, 43-49.
- Chirico, A., Yaden, D. B., Riva, G., Gaggioli, A. (2017). The effectiveness of immersive videos in inducing awe. *Nature – Scientific Reports*.
- Newberg, A. B., Wintering, N., Yaden, D. B., Zhong, L., Bowen, B., Averick, N., & Monti, D. A. (2017). Effect of a one-week spiritual retreat on dopamine and serotonin transporter binding: a preliminary study. *Religion, Brain & Behavior*, 1-14.
- Roepke, A. M., Benson, L., Tsukayama, E., & Yaden, D. B., (2017). Prospective writing: A new intervention facilitating growth and well-being after adversity. *Journal of Positive Psychology*.
- 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*.
- 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.
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Yaden, D. B., Smith, E. E., & Pawelski, J. O. (2016). Secularism and the science of well-being. In Zuckerman, P., & Shook, J. (Eds.) *The Oxford Handbook of Secularism*. Oxford University Press.

Jeremy Clifton Publications:

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., and Seligman, M. E. P. (in press). Primal World Beliefs. *Psychological Assessment*.

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:

Curtis, B., Giorgi, S., Buffone, A. E., Ungar, L. H., Ashford, R. D., Hemmons, J., ... & 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.

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*.

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*.

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*.

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*, doi:10.1080/01292986.2018.1453849

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.

Abdul-Mageed, M., Buffone, A., Peng, H., Giorgi, S., Eichstaedt, J. C., & Ungar, L. H. (2017). Recognizing pathogenic empathy in social media. In *Proceedings of the Eleventh International AAI Conference on Web and Social Media (ICWSM 2017)* (pp. 448-451).

We built a model to predict pathogenic empathy from social media language on a data set we collected of users (Facebook posts and answers to a new questionnaire measuring empathy). We obtained promising results in identifying individual's empathetic states from their social media.

Almodaresi, F., Ungar, L., Kulkarni, V., Zakeri M., Giorgi, S. & Schwartz, H. A. (2017). On the distribution of lexical features in social media. In *Proceedings of the 55th Annual Meeting of the Association for Computational Linguistics (Volume 2: Short Papers)* (Vol. 2, pp. 79-84).

In this paper, we empirically characterized various lexical distributions at different levels of analysis. We demonstrate that modeling lexical features for the correct level of analysis leads to marked improvements in common social scientific prediction tasks.

Guntuku, S.C., Lin, W., Carpenter, J., Ng, W.K, Ungar, L. & Preotiuc-Pietro D. Studying personality through the content of posted and liked images on Twitter. In *Proceedings of the 2017 ACM on web science conference* (pp. 223-227). ACM.

In this study, we analyzed image posting and liking behavior of users with different personality traits, and built computational models to predict users personality based on these images.

Guntuku, S., Ramsay, J. R., Merchant, R. M., & Ungar, L. H. (2017). Language of ADHD in adults on social media. *Journal of Attention Disorders*.
<https://doi.org/10.1177/1087054717738083>

In this study, we computationally analyzed the language of social media users diagnosed with ADHD to understand what they talk about, and how their language is correlated with users' characteristics such as personality and temporal orientation. Users with ADHD were found to be less agreeable, more open, to post more often, and to use more negations, hedging, and swear words.

Guntuku, S. C., Yaden, D. B., Kern, M. L., Ungar, L. H., & Eichstaedt, J. C. (2017). Detecting depression and mental illness on social media: an integrative review. *Current Opinion in Behavioral Sciences*, 18, 43-49.

In this paper, recent studies that aimed to predict mental illness using social media are reviewed. We found that automated detection methods may help to identify depressed or otherwise at-risk individuals through the large-scale passive monitoring of social media, and in the future may complement existing screening procedures.

Preotiuc-Pietro D., Liu Y., Hopkins, D. & Ungar, L. (2017). Beyond binary labels: Political ideology prediction of Twitter users. In *Proceedings of the 55th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers) (Vol. 1, pp. 729-740)*.

This study examines users' political ideology using a seven-point scale on a new survey-based data set of Twitter users. The results highlight differences in both political leaning and engagement, and show that ideology prediction is a much harder task than previously reported. We also introduce new methods for improving prediction accuracy.

Preotiuc-Pietro D., Carpenter J. & Ungar, L. (2017). Personality driven differences in paraphrase preference. In *Proceedings of the Workshop on Natural Language Processing and Computational Social Science (pp. 17-26)*.

In this study, we devised a simple yet effective method for quantifying word and phrase preference in a very large sample of Facebook posts written by users high or low in each personality trait. We found that differences in paraphrase choice are likely to be useful in text-to-text generation and dialogues systems.

Rieman, D., Jaidka, K., Schwartz, H. A., & Ungar, L. Domain adaptation from user-level facebook models to county-level twitter predictions. In *Proceedings of the Eighth International Joint Conference on Natural Language Processing (Volume 1: Long Papers)*, November 2017.

In this study, we propose a two-step algorithm, Target Side Domain Adaptation (TSDA) for such domain adaptation when no labeled Twitter/county data is available. In the case of predicting the Big Five county-level personality traits, TSDA outperforms a state-of-the-art domain adaptation method, gives county-level predictions that have fewer extreme outliers, higher year-to-year stability, and higher correlation with county-level outcomes.

Schwartz, H. A., Rouhizadeh, M., Bishop, M., Tetlock, P., Mellers, B., & Ungar, L. (2017). Assessing objective recommendation quality through political forecasting. In *Proceedings of the 2017 Conference on Empirical Methods in Natural Language Processing (pp. 2338-2347)*.

We explore quality assessment with respect to both subjective (i.e. users' ratings) and objective (i.e., did it influence? did it improve decisions?) metrics in a massive online geopolitical forecasting system, ultimately comparing linguistic characteristics of each quality metric. Using a variety of features, we predict all types of quality with better accuracy

than the simple yet strong baseline of recommendation length. Our analyses also reveal rater biases.

Schwartz, H. A., Giorgi, S., Sap, M., Crutchley, P., Eichstaedt, J. & Ungar, L. (2017). DLATK: Differential Language Analysis ToolKit. In Proceedings of the 2017 Conference on Empirical Methods in Natural Language Processing: System Demonstrations (pp. 55-60).

We present Differential Language Analysis Toolkit (DLATK), an open-source python package and command-line tool developed for conducting social-scientific language analyses. DLATK's novel strengths lie in analyses useful for psychological, health, and social science.

Sedoc, J., Preoțiuc-Pietro, D., & Ungar, L. (2017). Predicting emotional word ratings using distributional representations and signed clustering. In Proceedings of the 15th Conference of the European Chapter of the Association for Computational Linguistics: Volume 2, Short Papers (Vol. 2, pp. 564-571).

In this study, we developed a method that automatically extends word-level ratings to unrated words using signed spectral clustering of vector space word representations. This method achieves superior out-of-sample word rating prediction on both valence and arousal dimensions across three different languages (English, Spanish and Dutch) when compared to state-of-the-art word similarity based methods.

Smith, R. J., Crutchley, P., Schwartz, H. A., Ungar, L., Shofer, F., Padrez, K. A., & Merchant, R. M. (2017). Variations in Facebook posting patterns across validated patient health conditions: A prospective cohort study. *Journal of Medical Internet Research*, 19(1).

To develop targeted health interventions involving social media, we sought to identify the patient demographic and disease predictors of frequency of posting on Facebook. The aims were to explore the language topics correlated with frequency of social media use across a cohort of social media users within a health care setting, evaluate the differences in the quantity of social media postings across individuals with different disease diagnoses, and determine if patients could accurately predict their own levels of social media engagement.

Son, Y., Buffone, A., Schwartz, H.A. & Ungar, L. (2017) Recognizing counterfactual thinking in social media texts. Annual Meeting of the Association for Computational Linguistics.

In this paper, we created a counterfactual tweet dataset and explore approaches for detecting counterfactuals using rule-based and supervised statistical approaches. A combined rule based and statistical approach yielded the best results, outperforming either approach used alone.

Yaden, D. B., Eichstaedt, J. C., Kern, M. L., Smith, L. K., Buffone, A., Stillwell, D. J., ... Schwartz, H. A. (2017). The language of religious affiliation: Social, emotional, and cognitive differences. *Social Psychological and Personality Science*.
<https://doi.org/10.1177/1948550617711228>

In this study, we examined language from 12,815 Facebook users in the United States and United Kingdom who indicated their religious affiliation. Religious individuals used more positive emotion words and social themes, while nonreligious people expressed more negative emotions like anger and categories related to cognitive processes. Nonreligious individuals also used more themes related to the body and death.

Youyou, W., Stillwell, D., Schwartz, H. A., & Kosinski, M. (2017). Birds of a feather do flock together: Behavior-based personality-assessment method reveals personality similarity among couples and friends. *Psychological Science*, 28(3), 276-284.

We argue that the lack of evidence for personality homophily derives from the tendency of individuals to make personality judgments in relation to a salient comparison group. We address this limitation by employing personality measures based on behavior and language that are resistant to this bias. Results based on a large sample of participants provide evidence for a strong personality homophily between romantic partners and between friends.

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.

Coppersmith, G., Hollingshead, K., Schwartz, H. A., Ireland, M. E., Resnik, R., Loveys, K., ... & Ingraham, L. (2016). The clinical panel: Leveraging psychological expertise during NLP research. In *Proceedings of the First Workshop on NLP and Computational Social Science* (pp. 132-137).

We provide frank assessments of our work bridging the computational linguistics and psychology communities. We hope these assessments provide a foundation upon which those embarking on novel computational social science projects might structure their interactions.

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 as 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 correlated 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., Bittenheim, 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.