Name: Pavel Goldstein **Date: 12/06/2019**

CURRICULUM VITAE

1. Personal Details

Permanent Home Address: Kamon, HaMitzpor 27

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2. Higher Education

a. Undergraduate and Graduate Studies

Period of Study	Name of Institution and Department	Degree
2006-2008	Department of Psychology/ Department of Statistics, University of Haifa	BA
2009-2011	Department of Statistics, University of Haifa	MA
2013-2017	Department of Psychology, University of Haifa	PhD

b. Post-Doctoral Studies

Period of Study	Name of Institution and Department/Lab	Name of Host
2016 – present	Cognitive Affective Neuroscience lab, Department of Psychology and Neuroscience, University of Colorado, Boulder	Prof. Tor Wager

3. Academic Ranks and Tenure in Institutes of Higher Education

Years	Name of Institution and Department	Rank/Position
2019 (October)	University of Haifa, School of Public Health	Tenure Track

4. Offices in Academic Administration

Years		Role
2019	University of Haifa, School of Public Health	Head of Bistatistics Master program (MPH)

5. Scholarly Positions and Activities outside the University

Years	**Memberships in Academic Professional Associations**
2010 - present	International Biometric Society (IBS)
2019 - present	International Association for the Study of Pain (IASP)

Years	**Editorial Assignments**
2020	Guest Editor for Frontiers in Neuroscience

Years	**Reviewing for Refereed Journal**
2014 - 2016	Neuropsychologia (IF=3.3)
2015 - present	Social Cognitive Affective Neuroscience (SCAN) (IF=4.89)
2016 - present	Nature Scientific reports (IF=4.85)
2018 - present	Developmental Review (IF=4.80)
2019 - present	Journal of Consulting and Clinical Psychology (JCCP) (IF=4.5)
2019 - present	Perspectives on Psychological Science

Years	**Reviewing for Fund Agencies**
2017 - present	Israel Science Foundation (ISF)
2018 - present	German-Israeli Foundation for Scientific Research and Development (GIF)

6. Active Participation in Scholarly Conferences

a1. International Conferences - Held Abroad

Date	**Name of Conference**	**Place of Conference**	**Subject of Lecture/Discussion**	**Role**
June, 2014	The Sixth International conference for	Kaliningrad , Russia	Why touch affects pain? The role of social touch in the communication of empathy	speaker

Date	Name of Conference	Place of Conference	Subject of Lecture/Discussion	Role
	Cognitive Science			
May, 2015	**Hyperscanning conference**	**Paris, France**	**The role of the social touch in brain-to-brain synchronization during the pain.**	**Invited speaker**
September, 2015	Conference of togetherness research	Paris, France	Regulating inter-partner heart rate and respiration coupling during empathy for pain	Speaker
March, 2017	Big Data conference	Boulder, Colorado, US	Predicting pain by voice characteristics	Speaker
April, 2018	STEM educational conference	Ukraine	Biofeedback in education	Speaker
September, 2018	Hyperscanning in Social Neuroscience	China	Effect of the touch on interpersonal synchrony during pain	Keynote speaker
July, 2019	The SIPS conference on placebo studies	Leiden, Netherlands	Clinician-patient movement synchrony mediates social group effects on interpersonal trust and perceived pain	Speaker

a2. **<u>International Conferences - Held in Israel</u>**

Date	Name of Conference	Place of Conference	Subject of Lecture/Discussion	Role
May, 2013	International Biometric Society conference	University of Tel-Aviv	High-throughput Genome-wide Scan for Epistasis	Speaker
November, 2015	Advances in Neurofeedback: Research and Practice	University of Tel-Aviv	Regulating inter-partner heart rate and respiration coupling during empathy for pain	Poster
February, 2016	The Neuroscience of Social Interactions and Memory	Haifa, Israel	Brain-to-brain coupling during handholding predicts pain reduction	Poster
April, 2018	Israel-Ukraine educational forum	Tel-Aviv, Israel	Biofeedback in education	Speaker
June, 2019	Israel-Ukraine educational forum	Tel-Aviv, Israel	Academia-industry alliance	Invited speaker
June, 2019	2nd International Public Mental Health Conference (EUPHA)	Jerusalem, Israel	Mobile platform for chronic pain patients	Speaker

a3. **Local Conferences**

Date	Name of Conference	Place of Conference	Subject of Lecture/Discussion	Role
May, 2012	Israel Statistics Association conference	University of Tel-Aviv	High-throughput Genome-wide Scan for Epistasis	speaker
December, 2012	Israel Society for Neuro-science (ISFN) Annual meeting	Eilat, Israel	Why touch affects pain? The role of social touch in the communication of empathy.	speaker
May, 2013	The 17th Annual Meeting of Society for biological psychiatry	Hagoshrim	Dietary sodium, added salt - associations with depression	speaker
December, 2014	Israel Society for Neuro-science (ISFN) Annual meeting	Eilat, Israel	Touch analgesia: physiological interpersonal synchrony	speaker
February, 2015	The Second Conference on Cognition Research of the Israeli Society for Cognitive Psychology	Akko, Israel	Why touch affects pain? Physiological synchrony as communication of empathy	speaker

b. **Organization of Conferences or Sessions**

Year	Name of Conference	Place of Conference	Subject of Conference	Role
June, 2014	The Sixth International conference for Cognitive Science	Kaliningrad, Russia	Advances in Cognitive Sciences	Organizer of a panel

7. Invited Lectures (Others than in Scholarly Conferences)

Abroad

Year	Name of Forum	Place of Lecture	Subject of Lecture	Role
May, 2015	Hyperscanning conference	CNRS, Paris, France	Analyzing interpersonal physiological synchronization	Keynote speaker

Year	Name of Forum	Place of Lecture	Subject of Lecture	Role
March, 2018	Religion and Science forum	Jewish Community Center Boulder, CO	Measuring physiological changes during praying	Keynote speaker
September, 2018	School of Psychology and Cognitive Science	East China Normal University, China,	Effect of the touch on interpersonal synchrony during pain	Keynote speaker

In Israel

Year	Name of Forum	Place of Lecture	Subject of Lecture	Role
May, 2012	Statistical workshop for medical stuff	RAMBAM Health Care Campus,Haifa	Statistics in Medicine	Invited speaker
March, 2014	Workshop	Department of Psychology University of Haifa	Implementation of multilevel models in experimental research	Invited speaker
May, 2015	Family camp	Carmel Forest	Highlighting scientific research in press	Invited speaker
January, 2015	Workshop	School of Art Therapy, University of Haifa	Implementation of moderated mediation models	Invited speaker
May, 2018	Lecture	Department of Behavioral Sciences, University of Ariel	Implementation of Biopsychosocial model of pain	Invited speaker
May, 2018	Lecture	Public Health School, University of Haifa	Pain as Public Health phenomenon	Invited speaker
May, 2018	Lecture	Department of Cognitive Sciences, University of Haifa	Implementation of Biopsychosocial model of pain	Invited speaker

8. Colloquium Talks

Year	Name of Forum	Place of Lecture	Presentation
2015	Hyperscanning conference	CNRS, Paris, France	Analyzing interpersonal physiological synchronization
2018	Rothschild Fellows Colloquium	Hebrew University, Jerusalem	Mobile platform for multi-dimensional pain tracking

Year	Name of Forum	Place of Lecture	Presentation
2018	Hyperscanning in social neuroscience	Department of Psychology and Cognitive Science,East China Normal University, China	Effect of the touch on interpersonal synchrony during
2019	Colloquium	Department of Psychology and Cognitive Science,East China Normal University, China	Biopsychosocial model of pain: implementation

9. Research Grants

a. Grants Awarded

Role in Research	Other Researchers (Name & Role)	Title	Funded by (**C**= Competitive Fund)	Amount	Years
None					

b. Submission of Research Proposals – Pending

Role in Research	Other Researchers (Name & Role)	Title	Funded by (**C**= Competitive Fund)	Years
PI	Hagit Hel-Or	PainStory: Objective pain quantification based on patients' video:	Data Science Research Center (DSRC)	2020
PI		Clinician-patient synchrony mediates clinician effect on patient pain	Israeli Science Foundation (ISF) (C)	2020
PI	Tor Wager (PI)	Mobile platform for multidimensional tracking of pain	Binational Science Foundation (BSF) (C)	2020
Co-PI	Tam Vu (PI) Sidney D'mello (Co-PI, Marta Ceko (Co-PI), Tor Wager (PI)	PainAwear: An Online Adaptive Wearable System for Chronic Pain Regulation	National Science Foundation (C)	2020
Co-PI	Tam Vu (PI) Sidney D'mello (Co-PI, Marta Ceko (Co-PI),	Adaptive Wearable System for Pain	National Institutes of Health (C)	2020

Role in Research	Other Researchers (Name & Role)	Title	Funded by (C= Competitive Fund)	Years
	Tor Wager (PI)	Regulation after a Surgery		

c. Submission of Research Proposals – Not Funded

Role in Research	Other Researchers (Name & Role)	Title	Funded by (C= Competitive Fund)	Years
Co-PI	Tor Wager (PI)	Mobile platform for multidimensional tracking of pain	Advanced Industries Accelerator (C)	2018

10. Scholarships, Awards and Prizes

The Rothschild Foundation Postdoctoral Fellowship,
Arik Peretz Award for best masters thesis in Israel with applications in Biostatistics,
Scholarship for Excellence in PhD Studies (University of Haifa),
Scholarship for Excellence in Mater Studies (University of Haifa).

11. Teaching

a. **Courses Taught in Recent Years**

Years	Name of Course	Type of Course Lecture/Seminar/ Workshop/ Online Course/ Introduction Course (Mandatory)	Level	Number of Students
2008-2009	Statistical models B	Practice	BA	25
2008-2009	Statistical models A	Practice	BA	25
2010-2011	Case analysis	Practice	MA	10
2008-2011	Advanced Biostatistics	Practice	MA	25
2008-2011	Biostatistics	Practice	MA	25
2011-2015	Advanced Statistical Consulting	Practice	MA	7

Years	Name of Course	Type of Course Lecture/Seminar/ Workshop/ Online Course/ Introduction Course (Mandatory)	Level	Number of Students
2012-2013	Biostatistics for physicians	Practice	MD	20
2014-2015	Research Methods (international program)	Lecture	MA	18
2015-2016	Quantitative research Methods (international program)	Lecture	MA	16
2019-2020	Chronic pain: novel approach for diagnosis and treatment	Lecture	MPH	19
2019-2020	Final project for MPH students	Lecture	MPH	21
2019-2020	Statistical consulting for PhD students	Lecture	PHD	9

b. **Supervision of Graduate Students**

Name of Student /	Name of Other Mentors	Title of Thesis	Degree	Year of Completion/ In Progress	Students' Achievements
M.A. Students	NA				
Ph.D. Students					
Yafeng Pan	Prof. Hu Yi	Hyperscanning in lovers	**PhD**	**2019**	National Scholarship for PhD Students
Hiba Akel	Dr. Yaron Denekamp	The Impact of Clinical Decision Support System (CDSS) for Medication Treatment on the Quality Safety and Effectivity of Care:	**PhD**	**2020**	
Post Doctorate Students	NA				

12. Miscellaneous

I have provided data science consultations for scientists, medical stuff and industry through Statistical Consulting Unit at the University of Haifa between 2008-2016 years. Currently, I'm a data science mentor at "Catalyze CU" startup accelerator in the University of Colorado Boulder.

Also, I am a founder of a volunteering project Alive IL-UA, with the main goal to provide an exposure for Ukrainian psychologists to the novel methods of PTSD treatment by organizing webinars with PTSD specialists around the world.

I'm very excited to communicate science with the broader auditory by writing articles. In addition, my research was highlighted by press. For example:

The 'most exciting discovery in pain in the last 20 years' (The Sidney Morning Herald)

Holding hands to comfort loved ones does help reduce pain, US study shows (The Telegraph)

Hold hands with a lover in pain and your brains couple up too and pain goes down (DailyMail)

Big data and the social character of genes (ScienceDaily)

TV interview

Feeling blue? Maybe you are not eating enough salt, say scientists (Haaretz)

PUBLICATIONS

Index:
I.F. = Impact Factor (Source & Year)

V = Vatat List (The Council for Higher Education) למקרים שאין מדדים אחרים
R = Ranking (Source & Year)
Q = Quartile
 # = Student

First author is the main contributor, last author is usually the group head, the rest appear according to their relative contribution (unless otherwise specified).

A. Ph.D. Dissertation

Title: Interpersonal coupling during touch-related analgesia
Date of submission: 01/12/2016
Number of pages: 108
Language: English
Name of supervisor: Prof. Simone Shamay-Tsoory
University: University of Haifa
Publications: D5, D11, D12

A. Scientific Books (Refereed)

Authored Books – Published

none

Authored Books - Accepted for Publication

none

Edited Books and Special Journal Issues - Published

none

Edited Books and Special Journal Issues - Accepted for Publication

none

B. Monographs

Published

none

Accepted for Publication

none

D. Articles in Refereed Journals

Published

1. Perry, A., Aviezer, H., **Goldstein, P**., Palgi, S., Klein, E., & Shamay-Tsoory, S. G. (2013). Face or body? Oxytocin improves perception of emotions from facial expressions in incongruent emotional body context. *Psychoneuroendocrinology*, *38*(11), 2820-2825.
   IF 2013= 5.591
   R 2013= Endocrinology & Metabolism: 16/124 (Q1); Neurosciences: 33/252 (Q1); Psychiatry: 13/136 (Q1)

2. Kleinmintz, O. M., **Goldstein, P**., Mayseless, N., Abecasis, D., & Shamay-Tsoory, S. G. (2014). Expertise in musical improvisation and creativity: The mediation of idea evaluation. *PloS one*, *9*(7), e101568.
   IF 2014= 3.234
   R 2014= Multidisciplinary Sciences: 9/57 (Q1)

3. **Pavel Goldstein**, Abraham B Korol, and Anat Reiner-Benaim. Two-stage genome-wide search for epistasis with implementation to recombinant inbred lines (ril) populations. *PloS One*, 9(12):e115680, 2014.
   IF 2014= 3.234
   R 2014= Multidisciplinary Sciences: 9/57 (Q1)

4. **Pavel Goldstein** and Micah Leshem. Dietary sodium, added salt, and serum sodium associations with growth and depression in the U.S general population. *Appetite*, 79:83–90, 2014.
   IF 2014= 2.691
   R 2014= Behavioral, Sciences: 23/51 (Q2); Nutrition & Dietetics: 30/77 (Q2)

5. Shlomit Paz, **Pavel Goldstein**, Levana Kordova-Biezuner, and Lea Adler. Differences in benzene patterns among traffic and industrial areas and a prediction model for benzene rates based on nox values. *Water, Air, & Soil Pollution*, 226(5):1–11, 2015.
   IF 2016= 1.702
   R 2016= Water Resources: 39/88 (Q2)

6. **Pavel Goldstein**, Simone G Shamay-Tsoory, Shahar Yellinek, and Irit Weissman-Fogel. Empathy predicts an experimental pain reduction during touch. The Journal of Pain, 17(10):1049–1057, 2016.
   IF 2016= 4.519
   R 2016= Clinical Neurology: 31/194 (Q1); Neurosciences: 58/259 (Q1)

7. Adi Shoham, **Pavel Goldstein**, Ravit Oren, David Spivak, and Amit Bernstein. Decentering in the process of cultivating mindfulness: An experience-sampling study in time and context. *Journal of Consulting and Clinical Psychology*, 85(2):123, 2017.
   IF 2016= 4.593
   R 2016= Psychology, Clinical: 8/121 (Q1)

8. L Peled-Avron, **P Goldstein**, S Yellinek, I Weissman-Fogel, and SG Shamay-Tsoory. Empathy during consoling touch is modulated by mu-rhythm: An EEG study. *Neuropsychologia*, 2017.
   IF 2016= 3.197
   R 2016= Behavioral Neuroscience: 5/50 (Q1);

9. Rotem Paz, Ariel Zvielli, **Pavel Goldstein**, and Amit Bernstein. Brief mindfulness

training decouples the anxiogenic effects of distress intolerance on reactivity to and recovery from stress among deprived smokers. *Behaviour Research and Therapy*, 2017.
IF 2016= 4.064
R 2016= Psychology, Clinical: 12/121 (Q1)

10. Ariel Zvielli, Iftach Amir, **Pavel Goldstein**, and Amit Bernstein. Targeting biased emotional attention to threat as a dynamic process in time attention feedback awareness and control training (a-fact). *Clinical Psychological Science*, 4(2):287–298, 2016.
IF=N/A
SJR 2016= 3.712
R 2016= Clinical Psychology: 3/255 (Q1)

11. Yuval Hadash, Natalie Segev, Galia Tanay, **Pavel Goldstein**, and Amit Bernstein. The decoupling model of equanimity: Theory, measurement, and test in a mindfulness intervention. *Mindfulness*, 7(5):1214–1226, 2016.
IF 2016= 3.015
R 2016= Psychology, Clinical: 23/121 (Q1);

12. **Pavel Goldstein**, Irit Weissman-Fogel, and Simone Shamay-Tsoory. The role of touch and pain in regulating inter-partner physiological synchronization. *Nature Scientific Reports*, 7, 2017.
IF 2016= 4.259
R 2016= Multidisciplinary Sciences: 10/64 (Q1)
Public Attention (Altmetric) score: 694. Top 1% of Attention Score compared to outputs of the same age.

13. **Pavel Goldstein**, Irit Weissman-Fogel, Guillaume Dumas, and Simone G. Shamay-Tsoory. Brain-to-brain coupling during handholding is associated with pain reduction. *Proceedings of the National Academy of Sciences*, 2018. ISSN 0027-8424. 10.1073/pnas.1703643115.
IF 2018= 9.661
R 2018= Multidisciplinary Sciences: 4/64 (Q1)
Public Attention (Altmetric) score: 1167. Top 1% of Attention Score compared to outputs of the same age.

14. Ruimi, L., Hadash, Y., Zvielli, A., Amir, I., **Goldstein, P.**, & Bernstein, A. (2018). Meta-Awareness of Dysregulated Emotional Attention. *Clinical Psychological Science*, 2167702618776948.
IF 2016= 4.259
R 2016= Multidisciplinary Sciences: 10/64 (Q1)

15. **Pavel Goldstein**, Liad Josef, Naama Mayseless, Liat Ayalon, Simone Shamay-Tsoory. The oxytocinergic system mediates synchronized interpersonal movement during dance. *Scientific Reports (Nature Publisher Group)*, *9*, 1-8
IF 2018=4.26
R 2018= Multidisciplinary Sciences: 10/64 (Q1)

16.

Total number of citations : 217

E. Articles or Chapters in Scientific Books (Refereed)

Published
none

Accepted for Publication
none

F. Articles in Conference Proceedings

Published

none

Accepted for Publication

none

G. Entries in Encyclopedias

none

H. Other Scientific Publications

Published
none

I. Other Works and Publications

Pavel Goldstein. Holding your partner's hand can ease their pain. *AEON, 2017.*

J. Submitted Publications

1.Weihao Zheng, Choong-Wan Woo, Zhijun Yao, **Pavel Goldstein**, Lauren Y Atlas, Mathieu Roy, Liane Schmidt, Anjali Krishnan, Marieke Jepma, Bin Hu, Tor D. Wager. Pain-evoked reorganization in functional brain networks. Proceedings of the National Academy of Sciences in review (IF=9.66, 9 pages).

2. Pavel Goldstein, Elizabeth Losin, and Tor Wager. Clinician-patient synchrony mediates shared group membership pain bias : an ingroup-outgroup study. Submitted to *BMC Medicine* (IF=9.01, 7 pages).

3..Osnat Harari-Dahan, Ariel Zvielli,Iftach Amir, **Pavel Goldstein**, Amit Bernstein. Capturing Defensive Motivational System Processes in Anxiety via Spontaneous Micro-Movement: Mapping Freezing, Avoidance, and Approach to Social and Non-Social Threat. Submitted to *Nature Scientific Reports* (IF=4.26, 8 pages).

4.. Avigail Weiner, **Pavel Goldstein**, Oren Alkoby, Keren Doenyas and Hadas Okon-Singer. Characterizing blood pressure reactivity to aversive stimuli: Using continuous analysis to explore phasic changes in time. Will be submitted to *Psychological Science* (IF=5.67).

5..Coline Joufflineau, José Luis, **Pavel Goldstein**, Yann Fontbonne and Asaf Bachrach. Group synchrony as a result of time manipulation. Submitted to Emotion (IF=3.25, 8 pages).

K. Summary of my Activities and Future Plans

Research Focus and Interests

Pain can be conceptualized as a public health challenge for a number of important reasons having to do with prevalence, seriousness, disparities, vulnerable populations, the utility of population health strategies, and the importance of prevention at both the population and individual levels. Despite the immense body of research dedicated to the investigation of pain, studies generally measure pain expression unidimensionally, isolating the sufferer from any relevant social contexts. However, pain is a complex phenomenon, and therefore the research of it requires new integrative perspectives. A multiplex approach to research would prove valuable for understanding the biological, psychological, and social mechanisms that underlie pain perception. I believe that pathological physical processes and clinical/behavioral profiles (across overlapping pain and affect clinical entities) exist in tandem. A multilevel attempt to establish models of pain may greatly advance our understanding of the basic mechanisms underlying painful conditions, and the corresponding paths towards recovery. This multidimensional framework may ultimately allow us to better predict patients' risks and states, as well as recommend superior methods for the promotion and sustainability of human health in the real world.

My research focuses on the mechanisms and processes associated with human suffering. It assesses suffering at the point where physical pain and affective distress merge. I explore the mechanisms of pain perception, based on a **biopsychosocial model of pain**. I examine pain expression in voices, dynamic facial expressions, body movements, and multiple physiological signals, while heavily focusing on ecological settings. Moreover, my research investigates pain communication in all mentioned dimensions, while also exploring the analgesic effect of social touch. Additionally, I develop artificial intelligence technologies that are useful for integration in treatment approaches, such as mindfulness and psychotherapy. This research approach is based on the implementation of novel computer vision algorithms and machine learning.

Current Research

Focusing on a **social dimension of biopsychosocial model of pain**, one facet of my research strives to better understand the role of social influence during pain, particularly how the presence and actions of an observer affect pain perception. This line of research concentrated on behavioral outcomes, as well as peripheral and central markers of the nervous system. Primarily, I found an analgesic effect, brought upon by the touch of a romantic partner. This effect was also found to be predicted by the partner's empathy (Goldstein, Yellinek, Weissman Fogel and Shamay-Tsoory, 2016). Following this, the physiological bases of these findings were explored, demonstrating that social touch during pain increases heart rate, respiration and EEG synchronization within pairs. Moreover, the effects of touch on cardio-respiratory and brain-to brain inter-partner synchronization contributed to the analgesic effects of touch (Goldstein, Weissman Fogel and Shamay-Tsoory, 2017; Goldstein, Weissman Fogel, Dumas and Shamay-

Tsoory, 2017 Revise Resubmit, PNAS). In a EEG study we also showed that during consoling touch, a partner's empathy is modulated by mu-rhythm (Peled-Avron et al., 2017).
Along this line of research, I applied automatic computer vision algorithms, showing that Oxytocin increases movement synchrony (Josef, Goldstein, Mayseless and Shamay-Tsoory, 2017, in review), increases attention to the eyes region during s emotion recognition (Perry, Aviezer, Goldstein, Palgi, Klein and Shamay-Tsoory, 2013) and enhances a partner's movement and physiological synchronization by touch relieving pain (Goldstein, López-Solà, Koban, Kusko and Wager, 2017 in preparation). Finally, we found that the level of movement synchrony can decrease pain perception bias, as well as a trust toward a doctor bias (Goldstein, Losin and Wager, 2017 in preparation). Together with Dr. Asaf Bachrach (CNRS, Paris), I am additionally interested in a deeper interpersonal synchronization research, as part of the "Labodanse" project (Joufflineau, Luis, Goldstein, Fontbonne and Bachrach, 2017 submitted).
A second line of my research concentrates on **psychological dimension of biopsychosocial model by** developing a unique mobile platform that 1) allows patients to record and track interactions between pain, emotion, and bodily experiences; 2) delivers information about these experiences to clinicians in order to personalize prevention and treatment; 3) provides insurance companies with feedback about the status and health trajectories of patient populations. The application allows patients to report their experiences in an effortless and engaging way, and also captures patterns of speech and facial expressions, which deliver a readout of patients' emotional and pain behaviors. As a first step, I found that our voice features can accurately identify social anxiety and stress levels (Goldstein et al., 2018 in preparation).
In addition, I am intrigued and inspired by the idea of developing and testing non-pharmacological approaches for pain treatment such as mindfulness (Hadash, Segev, Tanay, Goldstein and Bernstein, 2016; Paz, Zvielli, Goldstein and Bernstein, 2017; Shoham, Goldstein, Oren, Spivak and Bernstein, 2017).
By investigating pain representation in the brain I'm also focusing on **biological dimension of biopsychosocial model of pain**. Currently, with my colleagues we found that components of brain systems that are separable at rest were integrated into a 'supersystem' during pain (Zheng et al., 2018, PNAS in review).
During the course of my research, I have developed and maintained fruitful collaborations in related research fields. Coordinating with Prof. Amit Bernstein and Dr. Hadas Okon-Singer, I am investigating an emerging dynamic process perspective on attentional bias (Zvielli, Amir, Goldstein and Bernstein, 2015; Harari-Dahan, Zvielli, Amir, Goldstein and Bernstein, 2017), as well as building a statistical model for a dynamic blood pressure analysis correspondingly (Weiner, Goldstein, Alkoby, Doenyas and Okon-Singer, 2017, in preparation) that could be implemented into pain paradigms in the future.

Future Research
Pain is an extremely serious problem with strong impacts on health and society. Over 30% American adults report daily chronic pain and the number of years lived with pain is increasing for the average American. The annual cost of managing pain ($635 billion in 2010 dollars) is greater than that of heart disease, cancer, and diabetes combined. In addition, chronic pain's unremitting presence can lead to a variety of mental health issues, including depression, stress, and fatigue, which often intensify pain. Thus, understanding pain as a public health priority helps to explain its tight linkage with social and economic determinants of health.
I am thrilled to direct my research focus towards the worldly-applicable challenge of pain recovery and the establishment of IPainlab (Integrative Pain lab). I plan on concentrating on the understanding of dynamic mechanisms of pain, expressed in behavior and physiology in close-to-natural environments, and on developing non-pharmacological new pain treatments to improve public health.
The tools I have built for pain research can easily be adopted for the Israeli population.

Moreover, the Minister of Healthcare in Ukraine (Dr. Ulana Suprun) proposed her support in adopting the platform for Ukrainian users.This highly ecological data may shed light on the expression of pain via voice and face expressions, providing us with a better understanding of emotional states and corresponding body representations of the symptoms and emotions associated with pain. The data collected by the app would prove valuable for describing a population with different pain conditions. It might also serve as a recruitment platform for other lab studies, providing multidimensional information about the potential subjects.
I plan to develop new pain treatments which will integrate biofeedback-based technologies and mindfulness approaches- integrating my current and future research endeavors. I am especially interested in developing personalized treatments for pain patients, available for entire population. Collaborating with pain therapists Dr. Howard Schubiner and Alan Gordon, we testing the efficacy of their unique therapy. Together, we are also building a startup company, with a patented technology for unlearning pain, by treating fear of pain and anxiety. Moreover, together with Prof. Paul Hansma (University of California), we are developing a biofeedback device for pain treatment. Further, I am planning to develop a new personalized approaches for treating pain based on the therapeutic approaches mentioned above.
My research is essential for more than pure knowledge. Ultimately, my future research is driven by the need to integrate between the academy and the industry. Providing data science consultations for medical device companies, academic researchers from multiple fields, and doctors helped me acquire a "common ground" between academic investigators, business representatives, and healthcare providers. When all parties see the advantage of combining the industrial drive to 'get things done' with the academic urge to 'understand how it works', the final outcomes improve significantly. Recently, I devised a model for a possible academy-industry collaboration, which received positive feedback from both sides. As a part of this model I am very excited to start a new *Biostatistics Master's Health Data Science track*, where the students will receive in-depth training in biostatistical theory and methods, augmented by specialized training in modern data science techniques.
I aim to design a new approach for pain as a Public Health problem, especially through the creation of novel wearable sensors and new machine learning algorithms that jointly analyze multimodal channels of information, focusing on pain disorders and personalized treatment. I am eager to start my own lab. I am confident in my ability to implement my findings into products which will improve life quality of pain patients, and help others to prevent this disorder.

In Preparation

Pavel Goldstein, Yoni Asher,Eduardo De Brito Lima Ferreira, Leonie Koban and Tor Wager. Speech acoustic features predict anxiety and stress. Will be submitted to *Psychological Science* (IF=5.67).

Yafeng Pan, **Pavel Goldstein**, Yi Hu Hu. Instructional modulation of social interactive learning via spatial-frequency-specific interpersonal brain synchronization. Will be submitted to PNAS

Pavel Goldstein, Tor Wager. Pseudo-casual relationships between pain and emotions in chronic pain patients. Will be submitted to *Pain* (IF=5.6).

Pavel Goldstein, Tor Wager. Chronic pain classification based on the emotional body maps. Will be submitted to *Pain* (IF=5.6).