Pin-Chun Chen, PhD

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Education

09/2017-06/2022	**PhD, Cognitive Sciences,** University of California, Irvine (UCI), CA, USA Thesis: Heart-brain Interaction during Sleep Drives Sleep-dependent Memory Gains
09/2018-06/2020	**MSc, Statistics**, University of California, Irvine (UCI), CA, USA
09/2014-06/2017	**BS, Psychology,** National Chengchi University, Taipei, Taiwan
09/2013-06/2017	**BEd, Education**, National Chengchi University, Taipei, Taiwan

Research Experience

06/2022 – present	**Postdoctoral Fellow,** Foster Lab, Department of Neurosurgery, University of Pennsylvania, Philadelphia, PA, USA (PI: Prof Brett Foster & Prof Bernhard Staresina) *Focus:* memory reactivation during sleep, iEEG, ripples
09/2017-06/2022	**Graduate Researcher,** Sleep and Cognition Lab, Department of Cognitive Sciences, University of California, Irvine, CA, USA (PI: Prof Sara Mednick) *Focus:* sleep and memory, working memory, simultaneous EEG-fMRI, multi-channel EEG, closed-loop electrical brain stimulation (tACS), pharmacology, autonomic-central coupling
09/2019-06/2021	**Statistical Consultant,** Department of Dermatology, School of Medicine, University of California, Irvine, CA, USA (PI: Dr. Dong Joo Daniel Kim) *Focus*: epidemiology, pediatric melanoma
04/2015-08/2017	**Undergraduate Researcher,** Sleep Lab, Department of Psychology, National Chengchi University, Taiwan (PI: Prof Chien-Ming Yang) *Focus:* chronic insomnia, acute insomnia, attentional biases, polysomnography
01/2016-06/2016	**Undergraduate Researcher,** Eye Movement and Reading Lab, Department of Psychology, National Chengchi University, Taiwan (PI: Prof Jie-Li Tsai) *Focus:* eye-tracker, parsing and eye-movement in reading Chinese

Peer-Reviewed Publications

9. **Pin-Chun Chen**, Jing Zhang, Julian F. Thayer, and Sara C. Mednick. (*In Press*) Understanding the roles of central and autonomic activity during sleep in the improvement of working memory and episodic memory. *Proceedings of the National Academy of Sciences*.

> I expect this opinion paper to have a strong impact. Integrating the independent and interactive roles of central and autonomic activities during sleep and wake in cognitive processing, we proposed a Slow Oscillation Switch Model, which identifies separate and competing underlying mechanisms supporting working memory and episodic memory at the synaptic, systems, and behavioral levels. We suggest areas of future research to better understand how the brain and body interact to support a wide range of cognitive domains during sleep.

8. **Pin-Chun Chen**, Katharine C. Simon, Negin Sattari, Lauren N. Whitehurst, Mohsen Naji, and Sara C. Mednick. (*2022*) Autonomic Central Coupling during Daytime Sleep Differs between Older and Younger People. *Neurobiology of Learning and Memory*, 107646.

> Building upon Chen et al., 2020a, this study examined age-related changes in autonomic–central interactions during a daytime nap. By comparing a group of young and older adults, we showed the first evidence of age-related declines in autonomic–central couplings during NREM sleep, which is associated with sleep-related working memory benefits, suggesting that poor autonomic–central couplings implicate potential age-related impairment to the prefrontal network that supports working memory.

7. **Pin-Chun Chen**, Hamid Niknazar, William A Alaynick, Lauren N. Whitehurst, and Sara C. Mednick. (*2021*) Competitive dynamics underlie cognitive improvements during sleep. *Proceedings of the National Academy of Sciences*, 118(51), e2109339118.

> This paper made a big impact on the sleep and memory community. Using pharmacological intervention and effective connectivity analysis, we provide the first empirical evidence that human sleep is a competitive arena in which cognitive domains vie for limited resources. We demonstrate that long-term memory and working memory are served by distinct offline neural mechanisms that are mutually antagonistic, suggesting that sleep is a competitive arena in which memory domains vie for limited resources.

6. **Pin-Chun Chen**, Negin Sattari, Lauren N. Whitehurst, and Sara C. Mednick (*2021*) Age-related loss in cardiac autonomic activity during a daytime nap. *Psychophysiology*, 58(7), e13701.

This paper was published in a special issue, aging and cerebrovascular health. By comparing the autonomic profiles between healthy young and older adults during a daytime nap and a period of quiet wakefulness, we demonstrated an age-related loss in parasympathetic modulation that is unique to NREM sleep but not in quiet wakefulness.

5. Dong Joo Kim, Joy Makdisi, Christina Regan, **Pin-Chun Chen**, Elizabeth Chao, Adam M. Rotunda. (*2021b*) Reconstruction of distal nasal defects using free cartilage batten grafting with secondary intention healing: a retrospective case series of 129 patients. *Dermatologic Surgery*, 47(1), 86-93.

This study was in collaboration with the department of dermatology. I co-authored as a statistician and performed various tests using R.

4. Dong Joo Kim, Tze-An Yuan, **Pin-Chun Chen**, Feng Liu-Smith, Natasha Atanaskova Mesinkovska, Hege Grande Sarpa. (*2021a*) Pediatric melanoma in the Hispanic population: an analysis of institutional and national data. *Pediatric Dermatology*, 38.5 (2021): 1102-1110

This study was in collaboration with the department of dermatology. I co-authored as a statistician and performed various tests using R.

3. **Pin-Chun Chen**, Lauren N. Whitehurst, Mohsen Naji, and Sara C. Mednick. (*2020b*) Coupling of autonomic and central events during sleep boosts working memory in healthy adults. *Neurobiology of Learning and Memory*, 173, 107267.

We examined moment-to-moment autonomic–central interactions by analyzing EEG and ECG during wake and daytime sleep. We identified rapid increases of heart rates that lasted 4-5 seconds and predominated in NREM sleep and found an increase in slow-wave (0.5-1Hz) and spindle activity (12-15Hz) 5 secs prior to peak of the heart rate burst. We further showed that slow-wave-activity time-locked on heart rate burst positively predicted working memory improvement, above and beyond traditional sleep measures.

2. **Pin-Chun Chen**, Lauren N. Whitehurst, Mohsen Naji, and Sara C. Mednick. (*2020a*) Autonomic activity during a daytime nap facilitates working memory improvement. *Journal of Cognitive Neuroscience*, 32 (10), 1963-1974

This study demonstrated heart-rate-variability as a biomarker of sleep-dependent working memory improvement, a key contribution to the field of sleep and memory research. We first establish that parasympathetic elevated during NREM in a daytime nap. Moreover, we find that this natural parasympathetic boost benefit working memory improvement after the nap.

1. Lauren N. Whitehurst, **Pin-Chun Chen**, Mohsen Naji, and Sara C. Mednick. (*2020*) New directions in sleep and memory research: the role of autonomic activity. *Current Opinion in Behavioral Sciences*, 33, 17-24.

This is an important opinion piece in which we integrate recent work at the intersection of autonomic nervous system and sleep memory research. It helps steer the community away from the traditional view that focus on the central nervous system sleep events towards an integrative view of the whole-body processes.

Academic Papers in Preparation

* These authors contributed equally to the work

Pin-Chun Chen*, Jing Zhang*, Arielle Tambini, Sara C. Mednick. Menstrual phase modulates the complex dynamics between episodic and working memory processing during sleep: a simultaneous EEG-fMRI study.

Jing Zhang*, **Pin-Chun Chen***, Arielle Tambini, Sara C. Mednick. How do slow oscillations facilitate working memory improvement? A simultaneous EEG-fMRI study.

Alessandra Shuster*, **Pin-Chun Chen***, Hamid Niknazar, Sara C. Mednick. Theta bursts during rapid-eye-movement (REM) sleep predict perceptual speed but not sleep-dependent perceptual learning.

Talks at Scientific Conference

The role of the autonomic nervous system in the science of sleep. Symposium speaker at the 35th Annual Meeting of the American Associated Professional Sleep Societies (Virtual; 2021, June)

The sleeping brain switches from frontal-subcortical working memory to hippocampal episodic memory processing during NREM sleep. Speaker at the 35th Annual Meeting of the American Associated Professional Sleep Societies (Virtual; 2021, June)

Competitive dynamics underlie cognitive improvements during sleep. Speaker at the 2021 Virtual Working Memory Symposium (Virtual; 2021, June)

The sleeping brain switches between working memory and long-term memory processing. Data blitz speaker at the Spring Conference at UCI Center for the Neurobiology of Learning and Memory, Irvine, CA (2021, May)

Trust your heart in sleep to fight against cognitive aging. Speaker at UCI Center for the Neurobiology of Learning and Memory Award Ceremony, Irvine, CA (2021, May)

The sleeping brain switches between frontal-subcortical working memory to hippocampal episodic memory processing during NREM sleep. UCI Associated Graduate Student Virtual Symposium (Virtual; 2021, April)

Vagolytic effect of Zolpidem on Sleep-dependent Memory: A Trade-off between Working Memory and Long-term Memory. Speaker at the 2020 Neuromatch conference 3.0 (Virtual; 2020, Oct)

Unsupervised Learning of Sleep Stages from Polysomnography (PSG) Data. Speaker at the 2nd Annual Computational Data Neuroscience Symposium (Virtual; 2020, Oct)

Age-related Losses in Cardiac Autonomic Activity during a Daytime Nap. Speaker at the 2nd Annual Computational Data Neuroscience Symposium (Virtual; 2020, Oct)

Coupling of Autonomic and Central events during Sleep Boosts Working Memory in Healthy Young Adults. Speaker at the 2020 Virtual Working Memory Symposium (Virtual; 2020, June)

The Roles of Autonomic Activities during Sleep on Cognition. Speaker at the Spring Conference at UCI Center for the Neurobiology of Learning and Memory (2019, May)

Posters at Scientific Conference

Pin-Chun Chen, Jing Zhang, Arielle Tambini, Sara C. Mednick (2022, June) How do Slow Oscillation and and Vagal Activity Support Working Memory? An EEG/fMRI Study. Poster presented at the 35thAnnual Meeting of the American Associated Professional Sleep Societies, Charlotte, NC, USA

Anjana Subramoniam, **Pin-Chun Chen**, Sara Mednick, Lauren N. Whitehurst (2022, June) Slow oscillation power and heart rate variability during sleep predicts next-day subjective sleepiness in healthy young adults. Poster presented at the 35th Annual Meeting of the American Associated Professional Sleep Societies, Charlotte, NC, USA

Pin-Chun Chen, Lauren N. Whitehurst, Hamid Niknazar, William A Alaynick, Lauren N. Whitehurst, and Sara C. Mednick (2021, Aug) Competitive dynamics underlie cognitive improvements during sleep. Poster presented at the 41st Annual Conference of North America Taiwanese Professors' Association (Virtual)

Pin-Chun Chen, Lauren N. Whitehurst, Hamid Niknazar, William A Alaynick, Lauren N. Whitehurst, and Sara C. Mednick (2021, April) The sleeping brain switches between working memory and long-term memory processing. Poster presented at the Women in STEM Symposium 2021 (Virtual)

Pin-Chun Chen, Lauren N. Whitehurst, Mohsen Naji, and Sara C. Mednick (2020, Aug) Age-related changes in central autonomic couplings during sleep. Poster presented at the 34th Annual Meeting of the American Associated Professional Sleep Societies (Virtual)

Pin-Chun Chen, Lauren N. Whitehurst, Mohsen Naji, and Sara C. Mednick (2019, Sep) Coupling of autonomic and central events during sleep boosts working memory in healthy young adults. Poster presented at the Annual Meeting of the World Sleep Congress, Vancouver, BC, Canada

Pin-Chun Chen, Negin Sattari, Lauren N. Whitehurst, and Sara C. Mednick (2019, June) Parasympathetic activity during sleep, but not wake, facilitates working memory improvement: A comparison of young and older adults. Poster presented at the Annual Meeting of the World Sleep Congress, Vancouver, BC, Canada

Pin-Chun Chen, Lauren N. Whitehurst, Mohsen Naji, and Sara C. Mednick (2019, June) Coupling of autonomic and central events during sleep boosts working memory in healthy young adults. Poster presented at the 33rd Annual Meeting of the American Associated Professional Sleep Societies, San Antonio, TX, USA

Pin-Chun Chen, Lauren N. Whitehurst, Mohsen Naji, and Sara C. Mednick (2018, April) A daytime nap facilitates working memory in healthy young adults. Poster presented at the International Conference on Learning & Memory 2018, Huntington Beach, CA, USA

Pin-Chun Chen, Ya-Wen Jan, and Chien-Ming Yang (2016, June). Discrepancy between subjective and objective actigraphic sleep estimation for individuals with low and high sleep vulnerability. Poster presented at the 30th Annual Meeting of the American Associated Professional Sleep Societies, Denver, CO, USA

Invited Talks

Competitive dynamics underlie cognitive improvements during sleep. Cognitive Sciences Graduate Student Presentation Bonanza, UCI, Irvine (2022, May)

Neural mechanisms of sleep and memory consolidation. Guest lecture on Sleep & Memory at UCI, Virtual (Virtual; 2021, May)

Trust your heart during sleep in the fight against cognitive aging. Speaker at UCI Grad Slam (Virtual; 2021, Jan)

Understanding sleep disorders via subjective and objective assessments. Guest lecture on Sleep & Consciousness at UCI (Virtual; 2020, Nov)

Sleep interventions to boost memory. Guest lecture on Sleep & Consciousness at UCI (Virtual; 2020, Nov)

Cued memory reactivation during sleep influences skill learning. Guest lecture on Sleep & Memory at UCI (Virtual; 2020, May)

Autonomic-central couplings during sleep drives sleep-dependent working memory gains. Cognitive Sciences Graduate Student Presentation Bonanza, UCI, Irvine (2020, Jan)

Age-related sleep and cognitive declines: sleep disorders and etiology. Guest lecture on Sleep & Consciousness at UCI (2019, Nov)

Awards & Honours

2019-2022	Undergraduate Research Grant Recipient Advisor (3 times), UCI ($2,400)
2022	AGS Recovery Fellowship, Associated Graduate Students, UCI ($1,000)
2022	Conference Travel Grant Award, Associated Graduate Students, UCI ($250)
2021	Grant Writing Fellowship, School of Social Sciences, UCI ($7,000)
2021	Cascade Mentoring Fellow, Graduate Division, UCI ($6,000)
2021	Jean-Claude Falmagne Research Award, UCI ($3,000)
2021	Renée Harwick Advanced Graduate Student Award, UCI ($1,000)
2021	Outstanding Scholarship Award, School of Social Sciences, UCI ($250)
2021	Grad Slam Semi-Finalist, Graduate Division, UCI (Honorary)
2020	Graduate Fellow, Division of Teaching Excellence and Innovation, UCI ($5,000)
2017	NVIDIA GPU Grant, NVIDIA Corporation ($2,000)
2017	Government Scholarship to Study Abroad, Ministry of Education, Taiwan ($32,000)
2017	Honorary member of the Phi Tau Phi Scholastic Honor Society (Honorary)
2017	Outstanding Graduating Award (1st Class Honor), National Chengchi University ($1,000)

Supervision

2020-2022	First-year PhD student analyzing large-scale heart-rate-variability and sleep EEG data, poster presentation at SLEEP 2022 – Anjana Subramoniam
2020-2022	First-year PhD student analyzing EEG bursts activity during rapid-eye-movement (REM) sleep, manuscript in preparation – Alessandra Shuster
2021-2022	Undergraduate research assistant recording simultaneous EEG-fMRI during overnight sleep and conducting behavioural experiments, UCI undergraduate research grants, poster presentation at UCLA Psychology Undergraduate Research Conference (PURC) – Shreya Cho, Kevin Sam, Ash Arumugam, Spencer Mair, Ashley Chen
2018-2022	Undergraduate research assistant recording EEG combined with electrical brain stimulation (tACS) during a daytime nap and conducting behavioural experiments, UCI undergraduate research grants – Mathew Bayati, Myca Cabuay, Nancy Liu, Angelica Busciglio, Ashley Chen, Suyeon Hwang, Cassandra Delvey

Membership

Sleep Research Society, Society for Neuroscience, Psychophysiology

Reviewer Duties

Current Biology, PNAS, eLife, Applied Psychophysiology and Biofeedback

Teaching Experience

Department of Cognitive Sciences, University of California Irvine

Instructor of Record

Probability and Statistics in Psychology II, Summer 2021

Lab Instructor/ Teaching Assistant

Probability and Statistics in Psychology II, Winter 2021, with Dr. Jeff Rouder
Probability and Statistics in Psychology I, Winter 2021, with Dr. Alex Etz
Advanced Experimental Psychology, Winter 2019, with Dr. Aaron Bornstein
Computer-Based Research in Social Science, Fall 2018, with Dr. Paul Shirey

Teaching Assistant

Language and the Brain, Spring 2019, with Dr. Greg Hickok
Psych Fundamentals, Summer 2019, with Dr. Alex Bower
Sleep & Consciousness, Fall 2019, with Dr. Sara Mednick

Division in Teaching Excellence and Innovation (DTEI), University of California Irvine

Graduate Pedagogical Fellow

Psych Fundamentals, Summer 2020, with Dr. Megan Peters

Department of Statistics, University of California Irvine

Lab Instructor/ Teaching Assistant

Basic Statistics, Winter 2020, with Dr. Lee Kucera
Introduction to Biostatistics, Spring 2020, with Dr. Brigitte Baldi

Department of Psychology, National Chengchi University

Teaching Assistant

Introduction to Eye Movements and Cognition, Spring 2016, with Dr. Jie-Li Tsai

Ongoing Collaborations

University of Pennsylvania, USA: Prof Brett Foster, Prof Daniel Yoshor, and Prof Michael Beauchamp
University of Oxford, UK: Prof Bernhard Staresina
University of California Irvine, USA: Prof Sara Mednick, Prof Julian Thayer
The Nathan S. Kline Institute for Psychiatric Research, Prof Arielle Tambini
University of Kentucky, USA: Prof Lauren Whitehurst

Media Spotlight

Soc sci shout out: Pin-Chun Chen, cognitive sciences Ph.D. '22. UCI News. May 31, 2022. https://www.socsci.uci.edu/newsevents/news/2022/2022-05-31-pin-chun-chen-shout-out

Pin-Chun Chen, UCI cognitive sciences graduate student, studies how your brain stays busy while you snooze UCI News. November 2, 2021. https://www.socsci.uci.edu/newsevents/news/2021/2021-11-02-pin-chun-chen-cog-sci.php

UCI-led study is first to find that long- and short-term memory vie for brain space. UCI News. December 14, 2021. https://news.uci.edu/2021/12/14/uci-led-study-is-first-to-find-that-long-and-short-term-memory-vie-for-brain-space/

Pin-Chun Chen named one of two Outstanding Scholar award recipients in social sciences. UCI News. June 1, 2021. https://www.socsci.uci.edu/newsevents/news/2021/2021-06-01-pin-chun-chen-outstanding-scholar.php