

Haonan (Holland) Sun

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EDUCATION

Wake Forest University

09/2025-05/2027

Master of Science in Psychology

GPA: 3.71/4.00

-Core Modules: Research Design and Analysis in Psychology I & II,
Human Cognition, Data Science for Psychologists, Biological Psychology

Advisor: Dr. Anthony Sali

Southwest University

09/2019-06/2023

Bachelor of Science in Psychology

GPA: 3.48/4.00

-Core Modules: Cognitive Psychology, Physiological Psychology, Perception,
Advanced MRI Methods, Biological Statistics and Experimental Design

Advisor: Dr. Yuan Liu

PUBLICATIONS

Zhang, H., **Sun, H.**, Li, J., Lv, Z., Tian, Y., & Lei, X. (2025). Gene Expression is Associated with Brain Function of Insomnia Disorder, rather than Brain Structure. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, 136, 111209. <https://doi.org/10.1016/j.pnpbp.2024.111209>

Zhang, H., **Sun, H.**, Li, J., & Lei, X. (2025). Subtypes of Insomnia Disorder Identified by Cortical Morphometric Similarity Network. *Human Brain Mapping*, 46(1), e70119. <https://doi.org/10.1002/hbm.70119>

Zhang, H., **Sun, H.**, Li, J., Yang, J., Fan, Y., Jülich, S. T., & Lei, X. (2024). Response Inhibition Impairment Related to Altered Frontal-striatal Functional Connectivity in Insomnia Disorder: A Pilot and Non-clinical Study. *Journal of Psychiatric Research*, 170, 138-146. <https://doi.org/10.1016/j.jpsychires.2023.12.023>

Zhang, H., **Sun, H.**, Li, J., Fan, Y., Jülich, S. T., & Lei, X. (2023). Subtypes of Insomnia Revealed by the Heterogeneity of Neuroanatomical Patterns: A Structural MRI Study. *Biological Psychology*, 180, 108591. <https://doi.org/10.1016/j.biopsycho.2023.108591>

POSTERS

Sun, H., Mu, B., & Sali, A. W. (2026, November). *Attentional flexibility as an internal context: A temporally graded context-dependent priming effect* [Poster presentation]. 34th Annual Object Perception, Attention, & Memory (OPAM) conference, San Diego, CA, United States.

Sun, H., Mu, B., & Sali, A. W. (2026, April). *Attentional states as psychological context for both explicit and implicit memory: An examination of encoding specificity* [Poster presentation]. Wake Forest University Psychology Department Poster Session, Winston-Salem, NC, United States.

Sun, H., Mu, B., & Sali, A. W. (2026, March). *Attentional states as psychological context for long-term memory: An examination of encoding specificity* [Poster presentation]. North Carolina Conference on Cognition (NCCC), Duke University, Durham, NC, United States.

Zhang, H., **Sun, H.**, Li, J., Lv, Z., & Lei, X. (2024, June). *Brain gene expression of insomnia disorder is associated with brain function, rather than structure* [Poster presentation]. The 30th Annual Meeting of the Organization for Human Brain Mapping (OHBM), Seoul, South Korea.

Sun, H., Wu, H., Liu, H., Yang, R. & Liu, Y. (2022, August). *Negative cognitive bias moderates the mediating effect of rumination on the relationship between anxiety/depression and sleep quality trajectories during COVID-19 lockdown: Preliminary evidence* [Poster presentation]. Southwest University National College Students' Innovative Entrepreneurial Training Program Mid-term Review, Chongqing, China.

RESEARCH EXPERIENCE

Localizing Learned Attentional Flexibility within The Spatial Attention Shift Process 06/2026-Present **- Master's Thesis (in progress)**

Supervised by Professor Anthony Sali, Wake Forest University

- Conceptualized the current direction of an in-progress thesis building on the learned spatial attentional flexibility literature, moving beyond its behavioral "shift-readiness" description to ask which sub-process of a spatial attention shift is modified, by decomposing the shift into disengagement, redirection, and reconfiguration stages.
- Formulated three potentially complementary mechanistic accounts, each with dissociable behavioral predictions: (i) faster disengagement, reframed through a two-dimensional stability–flexibility account; (ii) location-, direction-, or region-graded generalization of flexibility across space; and (iii) faster post-cue attentional reconfiguration at the destination.
- Designing behavioral experiments to dissociate these stages; an initial experiment adapts a gap/overlap paradigm to test whether a high-flexibility state eases disengagement and whether it necessarily carries a stability cost in spatial attention, while also providing a foundation for subsequent adaptation into an EEG experiment.

Attentional Flexibility as Internal Encoding Context for Explicit and Implicit Memory 09/2025-Present **- Project Leader**

Supervised by Professor Anthony Sali, Wake Forest University

- Conceptualized and led a two-experiment project investigating whether learned attentional flexibility states (shifting vs. holding) serve as internal contexts, extending the encoding specificity principle to attention-based contextual cues that modulate explicit recognition and implicit priming.
- Programmed Experiment 1 in MATLAB using Psychtoolbox, implementing a modified Rapid Serial Visual Presentation (RSVP) task that manipulated attentional flexibility through letter cues and presented word memory probes immediately following each attentional trial, with a mixed design assigning participants to either congruent or incongruent encoding-retrieval pairs to measure explicit recognition memory.
- Programmed Experiment 2 to extend the paradigm into implicit memory, using picture cues that doubled as memory probes to measure priming, under a fully within-subjects design to increase statistical power.
- Obtained IRB approval and managed informed consent; recruited and ran participants across both experiments (Exp 1: N = 21; Exp 2: N = 42), overseeing data collection and quality control.
- Analyzed behavioral data in R using (generalized) linear mixed-effects models and repeated-measures ANOVA for reaction time and accuracy, with post-hoc comparisons to interpret condition effects.
- Presented Experiment 1 at the North Carolina Conference on Cognition and the combined two-experiment findings at a departmental poster session; authored the analysis report.
- Currently reinterpreting the null congruence effect theoretically and developing follow-up studies to probe the effect at finer behavioral and neural levels.

Identifying Different Insomnia Subtypes from MRI Data Using Machine Learning 04/2022-03/2025

Supervised by Professor Xu Lei, Southwest University

Follow-up Study: Identifying Insomnia Subtypes and Progression Trajectories from Multimodal MRI, Linked to Distinct Sleep-EEG Phenotypes 02/2024-03/2025

- Project Leader

- Conceived and led the study, designing a framework that applies SuStaIn (Subtype and Stage Inference) to cross-sectional multimodal MRI to simultaneously identify insomnia subtypes and reconstruct their distinct progression trajectories (disease stages), and to map each subtype-trajectory onto a characteristic sleep-EEG phenotype.

- Independently handled all data organization and preprocessing; constructed MIND (Morphometric INverse Divergence) networks from T1-weighted MRI and extracted resting-state functional metrics (fALFF, ReHo, functional connectivity, and graph-theoretical network measures) to serve as the feature space for SuStaIn modeling.
- Developed and refined custom algorithms to process raw portable forehead sleep EEG recordings, extracting EEG-derived sleep profiles; used these to characterize the SuStaIn-derived subtypes and their progression structure, providing an initial sleep-phenotype description of the identified insomnia heterogeneity, moving beyond static subtyping toward a trajectory-level description of insomnia heterogeneity.
- Authored an internal research report summarizing the MIND construction pipeline, the SuStaIn subtype-and-stage modeling, and the resulting machine-learning findings.

Follow-up Study: Extending Insomnia Subtyping with Morphometric Similarity Networks and Multimodal Phenotypic Validation

03/2024-11/2024

- Co-Investigator

- Contributed to a follow-up study addressing limitations of the initial work by expanding the sample size and incorporating multi-feature morphometric similarity networks (MSNs) with brain transcriptomic data from the Allen Human Brain Atlas (AHBA).
- Processed T1-weighted MRI data using FreeSurfer and extracted surface-based morphometric features across 308 cortical regions, including surface area, cortical thickness, gray matter volume, Gaussian curvature, and mean curvature.
- Constructed individual-level cortical MSNs and computed regional MSN strength metrics for use in HYDRA-based insomnia subtype classification.
- Processed AHBA gene expression data using an adapted surface-based pipeline to generate regional gene expression matrices aligned with MSNs.
- Organized and analyzed portable forehead sleep EEG (UMindSleep wearable device), extracting device-derived objective sleep parameters, including sleep latency, total sleep duration, NREM/REM sleep durations, REM cycle count, and wake duration, to validate subtype-specific sleep phenotypes.
- Generated neuroimaging and transcriptomic visualizations for manuscript figures; contributed to reviewer responses on imaging preprocessing, MSN construction, and transcriptomic methods, and co-authored the resulting publication in *Human Brain Mapping*.

Initial Study: Identifying Insomnia Subtypes from Structural MRI Using Machine Learning

04/2022-06/2023

- Co-Investigator

- Collected and organized existing MRI data from 5 prior lab projects; preprocessed T1-weighted and DTI data from 56 insomnia patients and 73 healthy controls.
- Computed structural and microstructural brain metrics using SPM and FSL, including gray matter volume and cortical thickness from T1w images, and fractional anisotropy (FA) and mean diffusivity (MD) from deterministic tractography of DTI.
- Implemented kernel-based SVM classification and the HYDRA subtyping algorithm in MATLAB to distinguish insomnia patients from healthy controls and identify two distinct neuroanatomical subtypes.
- Presented both T1w and DTI subtyping results internally; the T1w-based subset was subsequently published in *Biological Psychology*.
- Drafted portions of the Methods and Discussion on structural MRI preprocessing and the HYDRA machine learning pipeline and assisted with responses to reviewer questions regarding methodological details during peer review.

Predicting College Students' Sleep Patterns through Metabolomics and Metagenomic Data

04/2024-12/2024

- Co-Investigator

Supervised by Professor Xu Lei, Southwest University

- Curated and processed third-party metabolomic and metagenomic data (preprocessed instrument outputs) from over 1,500 participants for downstream analysis.
- Performed dimensionality reduction and identified significant phenotype-associated clusters; explored multi-omics integration to link metabolomic and metagenomic signatures to sleep phenotypes.
- Developed R scripts to streamline metagenomic and metabolomic data processing for lab colleagues; released selected analysis code and project slides on GitHub.
- Summarized analyses and findings in two internal research reports.

Investigating the Link Between Brain-Wide Gene Expression and Structural and Functional Changes in Insomnia Patients 04/2023-11/2024

- Co-Investigator

Supervised by Professor Xu Lei, Southwest University

- Preprocessed structural MRI and fMRI data and calculated image metrics (GMV, ALFF, and ReHo), processed AHBA data to obtain gene expression data for different brain regions across multiple atlases.
- Calculated Cohen's d to assess differences in structural and functional metrics between 264 patients with insomnia disorder (ID) and 129 healthy controls (HC), with validation in an independent dataset (ID = 115, HC = 160) performed principal component analysis separately on structural and functional metrics and correlated these with gene expression matrices.
- Linked imaging measures to AHBA gene expression via Spearman correlation, with spatial autocorrelation-preserving permutation tests and bootstrap resampling to validate associations; identified 677 funcPC1+ and 582 funcPC1- genes correlated with the functional component, with no significant gene-structure (GMV) association; well replicated in the independent validation dataset.
- Performed GO/KEGG enrichment, tissue-specific, and cell-type-specific expression analyses on ID-related genes, implicating HPA axis dysregulation, GABAergic inhibitory neuron signaling, and circadian entrainment pathways in ID pathophysiology.
- Authored portions of the Methods, Results, and Discussion sections; generated neuroimaging and transcriptomic figures; conducted literature review to interpret identified gene sets and biological pathways; contributed to responding to reviewers' methodological concerns during peer review; published in *Progress in Neuro-psychopharmacology & Biological Psychiatry*.

National Cohort Study on Brain-Mind Development of School-Age Children in China (Southwest University Site) 05/2023-09/2023

- Research Assistant

Supervised by Professor Qinghua He, Southwest University

- Collected resting-state and task-based EEG data from school-age children, including scalp preparation (hair washing, electrode application), recording supervision, and real-time quality control.
- Conducted mock fMRI sessions to reduce pediatric scan anxiety, using familiarization and behavioral desensitization protocols
- Performed quality checks on collected EEG and behavioral data to ensure consistency with project-wide standards.

Behavioral and Neural Investigation of Executive Function in Subclinical Insomnia 05/2023-06/2024

- Co-Investigator

Supervised by Professor Xu Lei, Southwest University

- Collected and processed behavioral data from a comprehensive executive function (EF) battery in an undergraduate sample participating in the Behavioral Brain Research Project of Chinese Personality (BBP), assessing all three core EF components: response inhibition, working memory, and cognitive flexibility.
- Computed performance indices across all three EF paradigms in approximately 120 participants, including stop-signal reaction time and accuracy from the Stop-Signal Task; digit span scores from the Digit Span Task; and switch cost from the Task-Switching Task.

- Conducted CAT12-based VBM preprocessing of T1-weighted images and SPM12-based resting-state fMRI preprocessing; assisted with seed-based functional connectivity analyses.
- Contributed to the Methods section and manuscript revision for the resulting publication in *Journal of Psychiatric Research*, which reported the response-inhibition findings from this work.

Multi-Modal Data Collection in a Large-Scale Cognitive Project

05/2022-05/2023

- Research Assistant

Behavioral Brain Research Project of Chinese Personality (BBP)

Supervised by Professor Xu Lei, Southwest University

- Served as research assistant in a longitudinal multi-modal project integrating resting-state fMRI, computerized cognitive tasks, actigraphy, and self-report measures in undergraduate participants, contributing to a dataset that supported multiple peer-reviewed publications.
- Coordinated questionnaire administration and behavioral testing sessions for participants; performed batch processing and scoring of standardized psychological scales (e.g., PSQI, ISI, SDS, STAI).
- Managed actigraphy data collection pipeline, including device deployment, retrieval, and quality control across approximately 200 participants; developed analysis scripts to extract objective sleep parameters from raw actigraphy recordings.

A Longitudinal Moderated Mediation Study of Anxiety, Depression, and Sleep Quality During the COVID-19 Pandemic

09/2021-09/2023

- Student PI

Supervised by Professor Yuan Liu, Southwest University

Funded by the National College Students' Innovative Entrepreneurial Training Program (~ \$3,000)

- Received national-level undergraduate research funding through a three-round competitive review with a 15-minute oral research defense before a panel of psychology faculty from universities in Chongqing, China.
- Led a student team of 4 research assistants, overseeing study design, data collection logistics, and budget administration for a multi-site longitudinal study.
- Developed the research proposal examining how anxiety and depression shape the longitudinal trajectory of sleep quality, with rumination as a mediator and negative cognitive bias as a moderator.
- Constructed longitudinal moderated mediation models in Mplus to test the hypothesized mechanisms.

WORK EXPERIENCE

Lab Coordinator, Sleep and Neuroimaging Center (PI: Professor Xu Lei), Southwest University, Chongqing, China

04/2023-02/2025

Main Project Work: National Key R&D Program — Subproject on Cognitive Neuroscience Mechanisms of Insomnia Subtypes and Common Comorbidities

- Coordinated off-site data collection across 4 hospitals in Chongqing as the team lead, managing scheduling, clinical liaison with physicians, and on-site budget for travel and equipment.
- Led collection of around 150 insomnia patients out of approximately 600 total participants recruited by the team across 4 hospitals in Chongqing, including portable sleep EEG, actigraphy, cognitive tasks, and other psychological scales.
- Collaborated with medical and school professionals; partnered with the imaging center of the Faculty of Psychology, Southwest University, and Chongqing Shapingba Youlian Medical Imaging Center to conduct more than 140 structural MRI, resting-state fMRI, and task-based fMRI scans; assisted with overnight polysomnography (PSG) monitoring.
- Managed the project's multimodal datasets, including structural and functional MRI, actigraphy, and questionnaire data, running batch fMRI preprocessing with fMRIPrep; and performing systematic quality control on these data across approximately 600 participants.

General Lab Responsibilities:

- Maintained portable EEG and actigraphy devices for daily lab operations and trained new research assistants on equipment use and standardized data processing procedures.
- Curated existing datasets from previous lab projects, compiling a unified dataset of preprocessed behavioral, T1 structural MRI, and resting-state fMRI data from 100 healthy controls and 90 clinically diagnosed insomnia patients to support cross-project analyses.
- Completed metagenomic and metabolomic data analysis training at BGI (Beijing Genomics Institute), Shenzhen; subsequently processed lab-collected metagenomic and metabolomic data and established standardized processing protocols for the lab's downstream omics analyses.

HONORS & AWARDS

Dean's Scholarship (\$5,000) , Wake Forest University	06/2026
Dean's Scholarship (\$5,000) , Wake Forest University	09/2025
Second Class Scholarship (Top10%) , Southwest University	12/2022
National College Students' Innovative Entrepreneurial Training Program (Top1%; ~ \$2,200)	06/2022
Bronze Award (Top30%) , "Hanhong Cup" Innovation and Entrepreneurship Competition	05/2022
Winner (Top 1%) , China College Students "Internet+" Innovation and Entrepreneurship Competition	05/2022
National College Students' Innovative Entrepreneurial Training Program (Top1%; ~ \$800)	09/2021

TA EXPERIENCE

PSY 246-A: Culture and Psychology , Fall 2025 - Dr. Merve Balkaya-Ince, Wake Forest University
PSY 220-A: Biopsychology , Fall 2025 - Dr. Melissa Maffeo, Wake Forest University
PSY 151-E: Introductory Psychology , Spring 2026 - Dr. Stefon van Noordt, Wake Forest University

EXTRACURRICULAR ACTIVITIES

President, Student Union, Department of Psychology, Southwest University	09/2021-11/2022
• Organized the first Student Representative Conference and acted on over half of the proposals raised. • Restructured the Student Union, introduced 5 new events, and improved inter-department collaboration.	
Volunteer, Group Counseling Program, Chongqing No. 122 Middle School	09/2021-06/2022
• Conducted 5 group counseling sessions for 21 middle school students under professional teacher supervision. • Developed group counseling program grounded in developmental, cognitive, and personality psychology.	

SKILLS

Language:	English (fluent); Mandarin (native)
Neuroimaging Data	Preprocessing and analysis of structural (T1w, DTI) and functional (rs-fMRI, task-fMRI) MRI in both surface and voxel space; surface-based morphometry; resting-state EEG analysis. Proficient with SPM, FreeSurfer, FSL, ANTs, EEGLAB, and standardized pipelines fMRIPrep.
Multimodal Data:	Experienced with actigraphy, cognitive tasks and self-report measures; analysis of preprocessed genomics and metabolomics data.
Statistical and Data Analytical Skills:	Mixed-effects models (LMM/GLMM), Structural Equation / Latent Variable models, longitudinal mediation, multivariate methods; proficient with SPSS, Mplus, and R.
Programming:	R, MATLAB, and Python for analysis pipelines and scripting; cognitive experiment programming (Psychtoolbox).