

# ZHIHAN GUO

✉ zhihan0321@gmail.com | 📄 0000-0002-3346-7163 | Google Scholar | 📍 Beijing, China

## EDUCATION

**Sun Yat-sen University** | Double First Class University, Project 985 & 211

Guangzhou, China

M.S. in Psychology

Aug 2018 – Jun 2021

- Research Area: Cognitive Neuroscience, Latent Variable Modeling & Psychometrics
- Awards: Outstanding Graduate (Top 10%), First Prize Scholarship of Outstanding Students
- Notable Modules: MRI Data Analysis (95/100), Advanced Structural Equation Modeling (90/100)

B.S. in Applied Psychology

Aug 2014 – Jun 2018

- GPA: 4.0/5.0, Ranking: 4/61
- Research Area: Cognition
- Awards: Outstanding Graduate (Top 10%), First Prize Scholarship of Outstanding Students
- Notable Modules: Cognitive Psychology (99/100), Linear Algebra (90/100), Probability and Statistics (93/100), Statistical Methods for Psychology (90/100), Neuroimaging and Mental Health (92/100)

## PUBLICATIONS

**Journal Articles** (+ equal contribution, \* correspondent author)

1. Zhou, P., Wu, Q., Zhan, L., **Guo, Z.**, Wang, C., Wang, S., ... & Wu, X.\* (2023). Alpha peak activity in resting-state EEG is associated with depressive score. *Frontiers in Neuroscience*, 17, 1057908. [\[doi\]](#)
2. Zhan, L., Huang, Y., **Guo, Z.**, Yang, J., Gu, L., Zhong, S., & Wu, X.\* (2022). Visual over auditory superiority in sensorimotor timing under optimized condition. *Frontiers in Psychology*, 13, 1048943. [\[doi\]](#)
3. **Guo, Z.**, Niu, M., & Wang, Q.\* (2021). Target familiarity and visual working memory do not influence familiarity effect in visual search. *Scientific Reports*, 11(1), 7560. [\[doi\]](#)
4. Chen, J.\*, **Guo, Z.**, Zhang, L., & Pan, J.\* (2021). A partially confirmatory approach to scale development with the Bayesian Lasso. *Psychological Methods*, 26(2), 210. [\[doi\]](#)
5. **Guo, Z.**, & Chen, J.\* (2019). Teaching evaluation under the view of modern validity: reflection and suggestions [Chinese]. *Higher Education Exploration*, 3, 11-15. [\[doi\]](#)

### In Prepration

6. Sui, L.<sup>+</sup>, Zhan, L.<sup>+</sup>, **Guo, Z.**<sup>+</sup>, Wang, C., Huang, Y.\*, Wu, X.\*. Gamma synchronization in the primary auditory cortex precedes predicted event onsets in rhythmic temporal anticipation – neural evidence from intracranial EEG recording.

**Conference Presentations** (poster presenter, talk presenter)

7. Wang, J., **Guo, Z.**, Huang, J., Zhou, H. & Pan, J. (2019). *The Mechanism of Gender Differences in Attitude towards Legal Abortion: Indirect Effects of Sexual Permissiveness Attitudes and Gender Stereotypes*. The 22nd National Academic Conference of Psychology, 18-20 Oct, Hangzhou. [\[abstract\]](#)
8. **Guo, Z.**, Chen, J., & Tu., D. (2018). *Analysis of Raven's Advanced Progressive Matrices from a Cognitive Diagnosis Modeling Framework*. The 13th Cross-Straits Conference on Educational and Psychological Testing, 22-25 Oct, Taiwan. [\[slides\]](#)

## Patents

9. Fu, Y., Wu, S., **Guo, Z.**, Hu, J., Xiong, X. Method, Apparatus, Electronic Device, and Storage Medium for Features Normalization. China Patent: CN116913525A (under review).
10. Fu, Y., Wu, S., Xiong, X., **Guo, Z.** Yu, Y. Method, Apparatus, and Medium for Capability Assessment. China Patent: CN116910492A (under review).

## RESEARCH EXPERIENCES

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*Note. [x] refers to the item in the publication list.*

### Infinite Brain Technology

May 2022 – present

#### Clinical Trials of Computer-based Cognitive Training for ADHD and Schizophrenia

May 2022 – present

- Identified key interaction mechanisms and developed adaptive algorithms for cognitive training games tailored to children with ADHD and adults with schizophrenia.
- Processed log data from over 450 participants using Python and MySQL, analyzing correlations between game performance and clinical outcomes to optimize the training programs.
- For both ADHD and CIAS, the training group showed a significantly greater improvement in clinical outcomes.

#### Gamified Assessment and Training of Attention and Executive Functions <sup>[10]</sup>

May 2022 – Jan 2023

- Established a standardized event tracking framework for training and assessment games. Developed online service in Python to extract features from user interactions log.
- Utilized independent component analysis for feature dimensionality reduction and applied factor analysis to estimate user's cognitive abilities, and engineered tailored training recommendations algorithm based on it.

#### Machine Learning-based ADHD Assessment <sup>[9]</sup>

May 2022 – Nov 2022

- Computed statistics related to inattention and impulsivity during the test. Employed machine learning on a sample of over 1,000 in Python to construct a predictive model for screening individuals with ADHD.
- The model achieved a sensitivity of 83.3%, specificity of 95.2%, and an AUC value of 0.9.
- Engineered the real-time feature calculation service for online tests and successfully conducted large-scale assessments on over 5,000 primary students.

### Prof. Xiang Wu's Lab, Sun Yat-sen University

Jun 2019 – Jun 2021

#### Intracerebral Electroencephalography (iEEG) Cognitive Research <sup>[6]</sup>

Sept 2019 – Jun 2021

- Crafted experimental designs tailored to unique brain electrode implantation sites in epilepsy patients, integrating EEG data analysis with CT and sMRI data using Matlab tools like SPM, EEGLAB, and mfeeg.
- Developed a low-code cognitive experiment platform and streamlined EEG data process in MATLAB. Wrote operation manuals and conducted training for lab assistants.

#### Efficiency of Visual Processing of Temporal Sequences <sup>[2]</sup>

Nov 2020 – Apr 2021

- Conceptualized research questions and conducted sensorimotor tasks to investigate the ability of the visual system to process temporal information in isochronous and anisochronous bouncing ball sequences.
- Found the sense of collision is the key for the visual system to process time information rather than the continuous motion trajectory of the bouncing ball, and the visual system is capable of organizing temporal information from irregular sequences.

### Prof. Jinsong Chen's Lab, Sun Yat-sen University

Sept 2017 – Jun 2019

#### Q-Matrix Validation with Wald Test for GDINA <sup>[slides]</sup>

Jan 2019 – Nov 2019

- Developed a Q-matrix validation algorithm based on the Wald test, adeptly distinguishing over-specification and under-specification at each attribute and test item, facilitating expert independent assessment.

- Executed three simulation studies using R to assess the algorithm's efficacy and accuracy in identifying mis-specifications, including its power and Type I error rates under various error types and proportions. Benchmarked against existing methods in three empirical datasets.

#### Evaluation of Teaching Quality and Course Effectiveness <sup>[5]</sup>

Aug 2018 – Nov 2019

- Conducted interviews with teachers and students to develop the scale to evaluate the educational objectives, teaching process, resources of current courses at Sun Yat-sen University.
- Collected 2,219 samples online and analyzed data with R. The scale showed a strong internal consistency with a reliability coefficient  $\alpha$  of 0.977. Confirmatory factor analysis (CFA) conducted using Mplus resulted in favorable fit indices (e.g., CFI = 0.911, RMSEA = 0.041).
- Authored a 61-page project report to summarize the evaluation results and provided tailored improvement suggestions for 12 departments.

#### Cognitive Diagnosis Analysis of the Raven's Advanced Progressive Matrices (APM) Test <sup>[8]</sup>

Jun 2018 – Oct 2018

- Analyzed the Raven's APM test using cognitive diagnostic models in R to uncover additional abilities required beyond the five established problem-solving rules.
- Found that solving the test not only requires a grasp of specific rules but also the ability to apply the same rule repeatedly within a single item.

#### **Prof. Qi Wang's Lab, Sun Yat-sen University**

Jun 2016 – Jun 2018

#### Research on the Factors Contributing to the Familiarity Effect in Visual Search <sup>[3]</sup>

Apr 2017 – Apr 2018

- Conceptualized research questions, and conducted single- and dual-task experiments with Chinese characters as stimuli to discern the distinct roles of novel targets and familiar distractors in familiarity effect.
- Found that additional perceptual load does not hinder the efficiency of identifying targets among familiar distractors, highlighting the role of memory in filtering out distractors and improving search efficiency.

## PROFESSIONAL EXPERIENCES

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### Teaching Assistant

- Educational Measurement, Sun Yat-sen University 2019, 2020
- Special Topics on Psychometrics (graduate level), Sun Yat-sen University 2018

### Ad Hoc Reviewer

- Psychological Methods (JCR: Q1, IF: 7)

## WORK EXPERIENCES

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### Infinite Brain Technology

May 2022 – present

- Data Mining Engineer, Beijing, China

### Meituan

Jul 2021 – Apr 2022

- Human Resource, Beijing, China

## SKILLS & INTERESTS

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**Data Science & Programming:** Python, R, MATLAB, MySQL, Mplus, Git

**Languages:** Chinese (Native), English

**Interests:** Drums, Workout, Stand-up Comedy