

Ting-Ting Chang, Ph. D

Address: Department of Psychology
National Chengchi University, Taipei City 11605, Taiwan
e-mail: ttchang@nccu.edu.tw
office: +886-2-2939-3091 ext.62978
Website: <http://bnlnccu.wixsite.com/bnlnccu>

Academic Position

- Aug 2019 – current Associate professor with Tenure, Department of Psychology, National Chengchi University, Taiwan
- Aug 2014 – Jul 2019 Assistant Professor, Department of Psychology, National Chengchi University, Taiwan
- Aug 2014 – current Assistant Researcher, Research Center for Mind, Brain, and Learning, National Chengchi University, Taiwan
- 2015-2017 Secretary General, Taiwan Society of Cognitive Neuroscience
- 2012-2014 Postdoctoral Research Fellow, Department of Psychiatry and Behavioural Sciences, Stanford University, USA

Education

2005-2011 Ph. D., Institute of Neuroscience, National Yang-Ming University, Taiwan
2008-2009 Visiting Student, Department of Psychiatry and Behavioral Sciences, Stanford University, USA
2003-2005 M. S., Institute of Cognitive Neuroscience, National Central University, Taiwan
1999-2003 B. S., Department of Psychology, Minor, Foreign Language Literature, National Chung-Cheng University, Taiwan

Awards and Scholarships

- 2020 Junior Researcher Award, Academia Sinica
- 2019 Academic Research Award, NCCU
- 2018 Academic Research Award, NCCU
- 2017 Young Scholar Award, Science School, NCCU
- 2014 Subsidies for Distinguished Talents by NCCU Faculty and Research Personnel, MOST
- 2011 Grant of Postdoctoral Research Abroad Program, National Science Council
- 2010 Scholarship of Graduate Student Thesis, National Science Council
- 2009 Graduate Students Travel Grant, National Science Council
- 2007 Scholarship of Graduate Student Study Abroad Program, National Science Council
- 2006 Graduate Students Travel Grant, National Science Council

Current Research Interests

The main goals of my current research focus is to investigate the neural mechanism of children learning and cognitive development using behavioral and advanced functional magnetic resonance imaging technique. The current projects focused on the following areas:

- (1) behavioral and neural mechanism of mathematical cognition across the lifespan from childhood into adulthood;
- (2) neural substrates of typical and atypical developing children;
- (3) develop early brain-based predictor of cognitive skill;
- (4) develop brain-based interventions to improve cognitive skills in children with learning disabilities.

Publications

Journal Articles

- Yu, T. -F., Chen, H. -Y., Liao, M. -Y., Tien, H. -C., **Chang, T. -T.**, Chueh, C. -C, and Lee W. -Y.* (accepted). Solution-processable anionic doped conjugated polymer for nonvolatile organic transistor memory with synaptic behaviors. *ACS Applied Materials & Interfaces*.
- **Chang, T. -T.***, Lung, T. -C., Ng, C. -T., & Metcalfe, A. W. S. (2019). Fronto-insula-parietal network engagement underlying arithmetic word problem solving. *Human Brain Mapping* 40, 1927-1941. (*corresponding author; SCIE, IF=4.927; Rank: Neurosciences 48/261, Neuroimaging 2/14).
- He, Y., Wu, X., **Chang, T. -T.**, Jia, Y., Wang, J., Zhong, S., Huang, H., Su, Y., Deng, F., Wu, X., Niu, C., Huang, L., Huang, R.* (2018). Abnormal intrinsic cerebro-cerebellar functional connectivity in un-medicated patients with bipolar disorder and major depressive disorder. *Psychopharmacology*, 235(11), 3187-3200. (SCIE, IF=3.22; Rank: Neurosciences 112/261).
- **Chang, T. -T.***, Lee, P. -H., Metcalfe, A. W. S., (2018). Intrinsic insula network engagement underlying children's reading and arithmetic skills. *Neuroimage* 167, 162-177. (SCI, IF=5.835, * corresponding author).
- **Chang, T. -T.*** & Lung, T. -C. (2017). The cognitive neural mechanism of mathematical learning disabilities: Insights from MRI studies. *Contemporary Educational Research Quarterly*. (TSSCI, Scopus, * corresponding author).
- Lee, J. -R., Chen, Y. -C., **Chang, T. -T.***, Cheng, S. -K. (2016). Using Lexical Database to Examine Word Length Effect of Taiwanese English as Foreign Language (EFL) Learners. *Journal of Education & Psychology* 39 (2), 87-108. (TSSCI, * corresponding author).
- **Chang, T. -T.***, Metcalfe, A. W. S., Padmanabhan, A., Chen, T., Menon, V.* (2016). Heterogeneous and nonlinear functional development of posterior parietal cortex. *Neuroimage* 126, 184-195. (SCI, IF=6.357, * corresponding author)
- **Chang, T. -T.***, Rosenberg-Lee, M., Metcalfe, A. W. S., Chen, T., Menon, V.* (2015). Development of common neural representation for distinct numerical problems. *Neuropsychologia* 75, 481-495. (SCI/SSCI, IF=3.457, *corresponding author)
- **Chang, T. -T.** (2015) Brain science on learning and education. *Personnel Monthly*, 357, 4.

- Rosenberg-Lee, M.¹, **Chang, T. -T.**¹, Young, C., Wu, S., Menon, V. (2011). Functional dissociations between four basic arithmetic operations in the human posterior parietal cortex: A cytoarchitectonic mapping study. *Neuropsychologia*, 49, 2592-2608. (SCI/SSCI, IF=3.636, ¹equal contribution)
- Wu SS¹, **Chang T. -T.**¹, Majid A, Caspers S, Eickhoff, SB, Menon V (2009). Functional heterogeneity of inferior parietal cortex during mathematical cognition assessed with cytoarchitectonic probability maps. *Cerebral Cortex*, 19, 2930-2945. (SCI, IF=6.544, ¹equal contribution)
- **Chang, T. -T.** & Lee, J. -R.* (2009). Familiarity and age of acquisition ratings for English words by Taiwanese college students. *Bulletin of Educational Psychology* 41(2), 441-452. (TSSCI, * corresponding author).
- **Chang, T. -T.** & Lee, J. -R.* (2007). Measuring English vocabulary achievement with LDT for EFL learners. *Journal of Educational & Psychology* 30(3), 35-51. (TSSCI, * corresponding author).
- Lee, I. -P., **Chang, T. -T.**, Hung, D. -L. Tzeng, O. J. -L., & Lee, J. -R.* (2006). An unitary operating system for item information and position information in verbal memory. *Chinese Journal of Psychology* 48(4), 315-327. (TSSCI, * corresponding author).
- **Chang, T. -T.**, Hung, D. -L. Lee, J. -R. (2005). Second language learning: from neurocognitive perspectives. *Research in Applied Psychology* 28, 105-118.

Book Chapters

1. **Chang, T. -T.**, Lee, J. -R., & Yen, N. -S.* (2019). Mathematical learning and its difficulties in Taiwan: Insights from educational practice. In A. Fritz, V. G. Haase, & P. Rasanen (Eds), *International Handbook of Mathematical Learning Difficulties* (pp. 265 - 278). Springer International Publishing.

Conference Papers

- Ng, C. -T. & **Chang, T. -T.** (2020, Jun). Problem description modulates brain representation of arithmetic word problem solving. The 26th Annual Meeting of Human Brain Mapping. Virtual Conference.
- Ng, C. -T., **Chang, T. -T.** (2019.03). Arithmetic word problem solving is more than text comprehension: Neurocognitive evidence from fMRI in 3rd and 4th graders. 2019 annual meeting of Cognitive Neuroscience Society, Cognitive Neuroscience Society. San Francisco, USA.
- Yen, N. S., Li, C. W., **Chang, T. -T.**, Lin, C. Y. Y., Tan, D., Chen, Y. C. (2018.10). The role of motivational systems in dissecting the neural correlates of ambidextrous decision making. SNE 2018 Abstract Book, Society for Neuroeconomics, pp.68.

- **Chang, T. -T., Lung, T. -C., Ng, C. -T.** (2018, Jun). Arithmetic word problem solving is not merely text comprehension: neurocognitive evidence from fMRI. The 24th Annual Meeting of Human Brain Mapping, Organization of Human Brain Mapping. Suntec, Singapore.
- **Chang, T. -T., Lin, C. Y. Y., Yen, N. S., Tan, D. C., Chen, Y. C.** (2018.03). The role of optimism in dissecting the neural correlates of ambidextrous decision making. 2018 annual meeting of Cognitive Neuroscience Society, Cognitive Neuroscience Society. Boston, USA.
- **Lung, T. -C., Chang, T. -T.** (2018, Jan). Neural Correlates of Arithmetic Word Problem Solving. The 5th Annual Meeting of Taiwan Society of Cognitive Neuroscience. Taiwan Society of Cognitive Neuroscience. Taichung, Taiwan.
- **Iuculano, T.; Nicholas, J.; Chang, T. -T.; Metcalfe, A.; Menon, V.,** (2017. Nov), 'Failure to neurally differentiate between addition and subtraction problems as a key neurocognitive feature of developmental dyscalculia, ' 2016 Annual Meeting of Society for Neuroscience, Society of Neuroscience.
- **Chang, T. -T.; Lee, P. -H.; Metcalfe, A. W. M.,** (2017. Sep), 'Common and distinct intrinsic insula network engagement underlying children's reading and arithmetic skills, ' the 11th International Conference on Cognitive Science, the International Association for Cognitive Science.
- **Chang, T. -T.* Lee, P. -F. Metcalfe, A. W. S.,** (2017. Jun). Dissecting the neural circuits of cognitive control in children reading and arithmetic skills. The 23rd Annual Meeting of Human Brain Mapping, Organization of Human Brain Mapping, Vancouver, Canada.
- **Lee, P. -H., Chang, T. -T.** (2017. Jan). Development of functional dissociation and neural stability of four basic arithmetic operations. The 4th Annual Meeting of Taiwan Society of Cognitive Neuroscience, Taiwan Society of Cognitive Neuroscience, Chungli, Taiwan.
- **Liao, L. -Y. Chang, T. -T. Lu, Y. -W.** (2017. Jan), Development of intrinsic functional connectivity within human posterior parietal cortex. The 4th Annual Meeting of Taiwan Society of Cognitive Neuroscience, Taiwan Society of Cognitive Neuroscience, Chungli, Taiwan.
- **Chang, T. -T., Lee, P. -H., Metcalfe, A. W. M.** (2016, Nov). Development of neural stability for four basic arithmetic operations. 2016 Annual Meeting of Society for Neuroscience, San Diego, USA.
- **Iuculano T., Chang T. -T., Metcalfe, A. W. M., Battista, C., & Menon, V.** (2016, Jun). Indistinct Neural Representations for Arithmetic Problems in Children with Mathematical Disabilities. The 22st Annual Meeting of Human Brain Mapping, Organization of Human Brain Mapping, Geneva, Switzerland.
- **Lee, P. -H., Li, P. H. -S. Chang, T. -T.** (2016, Jan). Common neural representation between arithmetic operations with distinct quantities but similar problem solving strategies. The 3rd Annual Meeting of Taiwan Society of Cognitive Neuroscience, Taipei, Taiwan.
- **Chang, T. -T., Han, C. -C., Lee, P. -H., Lin, C. -Y. Yen, N. -S.** (2015, Jun). Neural correlates of complex multiplication problem solving. The 21st Annual Meeting of Human Brain Mapping, Organization of Human Brain Mapping, Honolulu, USA.
- **Chang, T. -T., Rosenberg-Lee, M., Metcalfe, A. W. S., Chen, T., Menon, V.** (2013, Aprl).

Development of operation-invariant neural representation for arithmetic problems. Poster presented at the 20th Annual Meeting of Cognitive Neuroscience Society, San Francisco, USA.

- **Chang, T. -T.**, Wu S. S., Menon V. (2009, June). Functional Dissociations Between Four Basic Mental Arithmetic Operations in the Human Inferior parietal Cortex. Poster presented at the 15th Annual Meeting of Human Brain Mapping, San Francisco, USA.
- **Chang, T. -T.**, Ning, L. -H., Lee J. R., Hung, D. L., & Tzeng, O. J. -L. (2007, Dec). Visual Word Recognition of English as Foreign Language Learners: Word Length Effect in Native Chinese Readers. Poster presented at the 12th International Conference on Processing of East Asia Related Languages, Tainan, Taiwan.
- **Chang, T. -T.**, Huang, Y. -C., Lee, J. R., Tzeng, O. J. -L., & Hung, D. L. (2007, July). Parallel or Serial? English visual word recognition of English as Foreign Language Learners. Poster presented at the 14th Annual Meeting of Society for the Scientific Study of Reading, Prague, Czech Republic.
- Lee, J. R., Kuo, W. J., **Chang, T. -T.**, Cheng, S. -K., Hung, D. L., Tzeng, O. J. -L., & Hsieh, J. C. (2007, April). English word recognition in a non-alphabetic speaker: an fMRI study. Poster presented at the 2nd Riken Brain Science Institute and Oxford-Kobe Joint International Symposium, Kobe, Japan.
- **Chang, T. -T.**, Kean, M. L., Lee, J. R., Tzeng, O., J. -L., & Hung, D. L. (2006, June). The lexicality effect in English word recognition for an EFL learner. Poster presented at the 12th Annual Meeting of Human Brain Mapping, Florence, Italy.
- **Chang, T. -T.**, Tzeng, O. J. -L., Hung, D. L., Lee, J. -R. (2005, Oct). The English word recognition process by English as Foreign Language learners - evidence from behavioral study. Oral presented at the 44th annual meeting of Taiwanese Psychological Association, Chungli, Taiwan.

Funded Grants

PI:

- Problem-based learning application on educational neuroscience. Ministry of Education Project, 08/01/2020-07/31/2021
- Brain fairs for elementary school children. Most Research Project, 08/01/2020-07/31/2021
- Neural mechanisms of arithmetic word problem solution in adolescence. MOST Research Project, 08/01/2019-07/31/2021
- The development and neural compensation of cognitive control circuits in reading arithmetic word problems. MOST Research Project, 01/01/2017-12/31/2018
- Cognitive and neural correlates of interventions on number representation for children with typical and low mathematical achievements. MOST Research Project, 08/01/2016 – 07/31/2019
- Longitudinal brain development of school-age children underlying arithmetic problem solving. MOST Research Project, 11/01/2015 – 10/31/2016
- Brain-based biomarker of mathematical skill underlying school-age children. NCCU New

Faculty Grant , 09/15/2014 - 12/31/2015

- Brain-based biomarker of mathematical skill underlying school-age children. MOST Research Project, 11/01/2014 - 01/31/2016

co-PI:

- The Neuro-Psychological Process of Gamification: An Integrated Study of Central and Autonomic Nervous System Based on the Affect Integration-Motivation Framework. MOST Research Project, 08/01/2020-07/31/2022
- Brain Research Initiative Net for Mind Science Taiwan Mind & Brain Imaging Center. MOST Project, 08/01/2018 – 07/31/2020.
- Establishing A big data network platform for the brain growth and connectivity development to early predict their long-term neurodevelopmental outcome using artificial intelligence. MOST Project, 06/04/2019-12/31/2020
- The impact of cross-cultural experience on exploitation and exploration orientation: Neuroscience approach. Most Research Project, 08/01/2018-07/31/2019
- An fMRI study of causal judgments in people with Williams Syndrome. MOST Research Project, 08/01/2017 – 07/31/2018.
- Teacher training program on brain knowledge and teaching. MOST Research Project, 09/31/2017 – 07/31/2018.
- Investigating the Role of Anterior Cingulate Gyrus and Sulcus in Ultimatum Game. MOST Research Project, 08/01/2017 – 07/31/2020.
- Brain Research Initiative Net for Mind Science Taiwan Mind & Brain Imaging Center. MOST Project, 08/01/2016 – 07/31/2018.
- The role of flexible optimism in balancing between exploitation and exploration: the Neuroscience approach. MOST Research Project, 08/01/2015 – 07/31/2018.
- Conceptual Frames and Gesture. MOST Research Project, 08/01/2014 – 07/31/2017.
- Brain Research Initiative Net for Mind Science Taiwan Mind & Brain Imaging Center. MOST Research Project, 08/01/2014 – 07/31/2016.

Ad-Hoc Reviewer

- Psychophysiology
- Translational Psychiatry
- Neuropsychologia
- Developmental Cognitive Neuroscience
- NeuroImage
- Frontiers in Human Neuroscience
- Behavioral and Brain Functions
- Frontiers in Psychology
- Bulletin of Educational Psychology (TSSCI)
- Universal Journal of Psychology

Grant Reviewer Service

- MOST (Ministry of Science and Technology), Taiwan
- Internal Grant, Taichung Tzu Chi Hospital

Press

- 2020/07/09 Academia Press Release – junior researcher award announced <https://www.sinica.edu.tw/ch/news/6582>
- 2018/11/01 Global Future Family - Overcoming fear of learning: Children's curiosity and parents' company <https://futureparenting.cwgv.com.tw/family/content/index/13103>
- 2018/07/20 MOST imaging research press conference <https://www.facebook.com/www.most.gov.tw/videos/2135787456664440/>
- 2017/10/22 CASE talk <https://www.youtube.com/watch?v=Ml7zjLhQM8>

Invited Talks, Presentations, & Workshop

2019

- Education and Brain, Summer Camp for Cognitive Neuroscience, National Central University
- Interdisciplinary Work Shop at Social Science School, National Chengchi University
- Seminar lecture, Department of Special Education, National Taiwan Normal University
- Seminar lecture, Graduate Institute of Early Childhood Education, National Taiwan Normal University

2018

- Application of brain science on math learning, Fu jen Catholic University
- Fronto-cingulate-parietal engagement underlying arithmetic learning, National Yang-Ming University
- Educational neuroscience workshop, Fu jen Catholic University
- MRI application in cognitive development, National Yang-Ming University
- How does brain learning, Minghu Junior High School

2017

- Math cognition symposium at the 11th International Conference on Cognitive Science.
- Neural system and cognitive neuroscience workshop, National Taiwan University
- General Psychology lecture, China Medical School
- Neural mechanism of dyscalculia, Taiwan Society of Child and Adolescence Psychiatry
- TMBIC Cognitive Neuroscience Workshop, Kaohsiung Medical University
- Education and Brain, Summer Camp for Cognitive Neuroscience, National Central University
- Math cognition and brain, National Taiwan University Hospital
- Seminar of Psychology Department, National Cheng Kung University
- Story of learning math, Center for the Advancement of Science and Education

2016

- Taipei Tech University
- fMRI workshop, National Taiwan University.
- Joint fMRI Lab Orientation Training, National Yang-Ming University.

2015

- TMBIC SPM workshop for RA, National Chengchi University.
- Graduate Institute of Linguistics, National Chengchi University.
- Department of English, National Chengchi University, Taipei.
- Neural system and cognitive neuroscience workshop, National Taiwan University.
- Taipei Municipal Jieshou Junior High School.
- Center of Teacher Education, Fu Jen Catholic University.
- TMBIC Cognitive Neuroscience Workshop, China Medical University.

2014

- TMBIC Cognitive Neuroscience Workshop, National Dong Hua University.

2011

- Graduate Institute of Science Education, National Taiwan Normal University, Taipei.
- Department of Materials Engineering, Ming Chi University of Technology, Taipei.

Teaching

- Introduction to educational neuroscience
- Application of fMRI on cognitive neuroscience
- Introduction to cognitive neurosciences
- Basic functional magnetic resonance imaging
- Introduction to event-related potentials
- Introduction to scientific communication
- Lab Rotation

Mentoring

Graduate students

- Chan-Tat Ng (09/2017-current, master student at Department of Psychology, National Chengchi University)
- Pei-Hsin Li (PhD student at College of Education, National Chengchi University)
- Yung He (master student of South China Normal University)
- Yuting Lin (master student of South China Normal University)

Undergraduate students

- Wenyi Yang (Department of Psychology, National Chengchi University)
- Xinyu Chen (Department of Psychology, National Chengchi University)
- Chungwei He (Department of Psychology, National Chengchi University)
- Paoju Chen (Department of Psychology, National Chengchi University)
- Lingyu Liao (Department of Psychology, National Chengchi University)
- Yishan Hung (Department of Psychology, National Chengchi University)

Research Assistants

- Wei-Ying Chiu
- Tzuyu Chen
- Peifang Li
- Tzuchen Lung
- Szu-Ti Lin
- Hsinsan Lin
- Chi-Chuan Chen
- Wenchien Huang