

Japan-U.S. Brain Research Cooperation Program
Group Joint Study Project Report

Field: Neurobiology of Disease

1. Principal Researcher
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Professor
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2. Project Title:
Influences on brain development in children and adolescents.
3. Japanese Group
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4. U.S. Group
Chief: Jay Giedd, MD, PhD, Professor, University of California, San Diego, USA
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Ben Maxwell, MD, Associate Professor, UCSD, Department of Psychiatry, USA
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5. Research Period: From 04/01/2017 to 03/31/2020 (3 years)
6. Abstract, Results, and Research Significance (300 words):
To explore the path, mechanisms, and influences on brain development in health and illness by using novel statistical methods optimized for the evaluation of longitudinal developmental data to integrate: (1) cutting edge multimodal image analysis techniques (i.e. structural MRI, functional MRI, DTI); (2) genetics and epigenetics; (3) psychological, cognitive, behavioral, clinical, and physiological measures; and (4) detailed assessments of risk and protective factors, of trauma, adverse events, and other environmental factors from early childhood until adolescent period. Thus, in order to answer to the problem that a diagnosis based on symptoms does not always lead to effective therapy, we have investigated children with reactive attachment disorder (RAD) associated with childhood maltreatment, and other neurodevelopmental disorders such as autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD). We believe our project has sought to create a framework for research on pathophysiology, especially in the fields of neuroscience and genomics, as Research Domain Criteria (RDoC) which the National Institute of Mental Health in the United States launched.
7. Other (Research-related concerns, particular points of note): N/P

The results that have been studied in the Japan-U.S. Brain Research cooperative Program are presented as a paper as follows.

1. Mizuno Y, Jung M, Fujisawa TX, Takiguchi S, Shimada K, Saito D, Kosaka H, Tomoda A*. Catechol-O-methyltransferase polymorphism is associated with the cortico-cerebellar functional connectivity of executive function in children with attention-deficit/hyperactivity disorder. *Sci Rep*, 7(1):4850, 2017.
2. Bennett A, Hopkins W, Feldman R, Gazzola V, Giedd J, Lamb M, Scheele D, Sheridan M, Suomi S, Tomoda A, Tottenham N.
Neural foundations of variability in attachment. *The Cultural Nature of Attachment: Contextualizing Relationships and Development*, edited by Keller H & Bard KA. Ernst Strüngmann Forum Reports, vol. 22, Cambridge, MA: MIT Press, pp245-271, 2017.
3. Fujisawa TX, Shimada K, Kojima M, Takiguchi S, Mizushima S, Kosaka H, Teicher M, Tomoda A*. Type and timing of childhood maltreatment and reduced visual cortex volume in children and adolescents with reactive attachment disorder. *Neuroimage Clin*, Jul 23;20:216-221, 2018.
4. Fujisawa TX, Nishitani S, Takiguchi S, Shimada K, Smith AK, Tomoda A*. Oxytocin receptor DNA methylation and alterations of brain volumes in maltreated children. *Neuropsychopharmacology*, May 9, 2019.
5. Jung M, Mizuno Y, Fujisawa TX, Takiguchi S, Kong J, Kosaka H, Tomoda A*. The effects of COMT polymorphism on cortical thickness and surface area abnormalities in children with ADHD. *Cereb Cortex*, 29(9):3902-3911, 2019.
6. Mizuno Y, Shimono KK, Jung M, Makita K, Takiguchi S, Fujisawa TX, Tachibana M, Nakanishi M, Mohri I, Taniike M, Tomoda A*. Structural brain abnormalities in children and adolescents with comorbid Autism Spectrum Disorder and Attention-Deficit/Hyperactivity Disorder. *Transl Psychiat*, 9(1):332, 2019.
7. Jung M, Takiguchi S, Hamamura S, Mizuno Y, Kosaka H, Tomoda A*. Thalamic volume is related to increased anterior thalamic radiations in children with reactive attachment disorder. *Cereb Cortex*, 7 March 2020.
8. Suzuki S, Fujisawa TX, Sakakibara N, Yazawa A, Fujioka T, Takiguchi S, Tomoda A*. Development of social attention and oxytocin levels in maltreated children. *Sci Rep*, 10(1) 7407 - 7407, 2020.
9. Matsunaga, M., Kikusui, T., Mogi, K., Nagasawa, M., Ooyama, R., & Myowa, M. (2020) Breastfeeding dynamically changes endogenous oxytocin levels and emotion recognition in mothers. *Biology Letters*, 16(6): 20200139.
10. Niwa, F., Kawai, M., Kanazawa, H., Okanoya, K., & Myowa, M. (2020) The development of the hypothalamus-pituitary-adrenal axis during infancy may be affected by antenatal glucocorticoid therapy. *Journal of Neonatal-Perinatal Medicine*, vol.13, no.1, 55-61, DOI: 10.3233/NPM-180040.
11. Shinohara, A. Kanakogi, Y., & Myowa, M. (2019) Strategic reputation management: Children adjust their reward distribution in accordance with an observer's mental state. *Cognitive Development*, 195-204.
12. Imafuku, M. Kanakogi, Y., Butler, D., & Myowa, M. (2019) Demystifying infant vocal imitation: The roles of mouth looking and speaker's gaze. *Developmental Science*, e12825. DOI: 10.1111/desc.12825
13. Imafuku, M., Kawai, M., Niwa, F., Shinya, Y., & Myowa, M. (2019) Audiovisual Speech Perception and Language Acquisition in Preterm Infants: A Longitudinal Study. *Early Human Development*, 128, 93-100. <https://doi.org/10.1016/j.earlhumdev.2018.11.001>.
14. Matsunaga, M., Tanaka, Y., & Myowa, M. (2018) Maternal nurturing experience affects the perception and recognition of adult and infant facial expressions, *PLoS ONE*, 13(10): e0205738. <https://doi.org/10.1371/journal.pone.0205738>.
15. Fukushima, H., Tanaka, Y., & Myowa, M. (2018) Temporal matching between interoception and exteroception: electrophysiological responses in a heartbeat discrimination task. *Journal of Psychophysiology*, <https://doi.org/10.1027/0269-8803/a000224>.
16. Myowa-Yamakoshi, M. (2018) The evolutionary roots of human imitation, action understanding and symbols. *Interaction Studies*, 19, 183-199. DOI 10.1075/is.17034.myo.
17. Arbib, M., Aboitiz, F., Burkart, J.M., Corballis, M., Coudé, G., Hecht, E., Liebal, K., Myowa-Yamakoshi, M., Pustejovsky J., Putt, S., Rossano, F., Russon, A.E., Schoenemann, P.T., Seifert, U., Semendeferi, K., Shnha, C., Stout, D., Volterra, V., Waciewicz, S., & Wilson, B. (2018) The comparative neuroprimatology

2018 (CNP-2018) road map for research on *How the Brain Got Language*, *Interaction Studies*, 19, 370-387. DOI 10.1075/is.18013.arb.

18. Tanaka, Y., Kanakogi, Y., Kawasaki, M., & Myowa, M. (2018) The integration of audio–tactile information is modulated by multimodal social interaction with physical contact in infancy, *Developmental Cognitive Neuroscience*, 30, 31–40. doi.org/10.1016/j.dcn.2017.12.001
19. Kumaki, Y. Moriguchi, Y., & Myowa-Yamakoshi, M. (2018) Expectations about recipients' prosociality and mental time travel relate to resource allocation in preschoolers. *Journal of Experimental Child Psychology*, 167, 278–294. doi.org/10.1016/j.jecp.2017.10.013