KATHERINE S. F. DAMME, PhD
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EDUCATION

2018 **Northwestern University, Chicago, IL**
Brain, Behavior and Cognition, Psychology, PhD (expected 2018)
Dissertation Proposal: "Structural and functional network architecture of bipolar spectrum disorder: Graph theoretical insights"

2015 Masters of Science: "Nucleus accumbens connectivity relates to trait risk for hypomania: A structural and functional analyses of hypomanic risk factors"

2009 **Vanderbilt University, Nashville, TN**
Bachelor of Arts in Psychology and Philosophy, Cum Laude
Research Concentration in Cognitive Neuroscience

Awards

2017 National Institute of Health, Neuroscience of Human Cognition Fellow (T32)
Title: 'Reward sensitivity neural circuitry along the bipolar spectrum: A connectivity perspective'
Award: Stipend support and research support.

2016 Society of Biological Psychiatry, Pre-doctoral Student Scholars Award
Award: Travel award, mentoring by senior SOBP members, and 3 years of meeting registration.

2015 National Institute of Health, Neurobiology of Information Storage Program Fellow (T32)
Title: 'Reward based learning on multiple levels of analyses'
Award: Stipend support and annual research support.

2013 National Science Foundation, Graduate Research Fellowship Program Honorable Mention
Title: 'Reward at Multiple Levels: Mapping the Relationship Between Structure and Function'
Award: (For meritorious applicants who do not receive Fellowship awards) Access to cyberinfrastructure resources through the XSEDE.

2011 National Institute of Health, Technical Intramural Research Training Award (IRTA)
Award: Two-year post-baccalaureate full-time training at NIH with access to graduate course work, research mentoring, and scientific seminars.

Publications

Peer Reviewed Articles

Nusslock, R., & Young, C.B., & **Damme, K. S.F.** (2014). Elevated reward-related neural activation as a unique biological marker of bipolar disorder: Assessment and treatment implications, *Behavioral Research and Therapy, 64*, 74-87.

Damme, K.S.F., Young, C.B., & Nusslock, R. (2017). Elevated nucleus accumbens structural connectivity associated with proneness to hypomanic symptoms, *Social Cognitive and Affective Neuroscience, 12*(7), 928-36.

Damme, K.S.F., Gupta, T., Nusslock, R., Bernard, J., Orr, J. & Mittal, V. (2018) Cortical Morphometry in the Psychosis Risk Period: A comprehensive perspective of surface features, *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging.*

Vargas, T., **Damme, K.S.F.,** & Mittal, V. Bullying Victimization in Typically Developing and Clinical High Risk (CHR) Adolescents: A Multimodal Imaging Study. *Schizophrenia Research.*

Under Review

Damme, K.S.F., Kelly, N., Glazer, J., Quinn, M., Chat, I., Young, K., Nusslock, R., Zinbarg, R., Bookheimer, S., & Craske, M. (under review) Willingness to wait and willingness to work for reward: Differential relations to executive function, *Cognitive Affective Behavioral Neuroscience (CABN)*.

Kelly, N., Akuamoah, J., & **Damme, K.S.F.** (under review) Self-enhancement processes influence the evaluation of scientific information.

Damme, K.S.F., Young, C. B., Kelly, N. J., Nusslock, R., Chein, J., Ng, T., Titrone, M., Black, C., & Alloy, L (under review) Amygdala Subnuclei Volume Abnormalities across the Bipolar Spectrum: Insight from Diffusion-based Subsegmentation and a High-Risk Design.

Osborne, J., **Damme, K.S.F.,** Gupta, T., Dean, D., Bernard, J., & Mittal, V.A. (under review) Timing dysfunction and cerebellar network abnormalities in youth at clinical high-risk for psychosis

Young, K.S., Bookheimer, S. Y., Nusslock, R., Zinbarg, R. E., **Damme, K.S.F.,** Chat, I., Kelley, N. E., Perez[1], Chen, K., Craske, M.G. Symptom dimensions of anxiety and depression are related to dissociable disruptions to threat neurocircuitry during fear acquisition.

Vargas, T., **Damme, K.S.F.,** Gupta, T., Cowan, R., Hooker, C. & Mittal, V. (under review) Differentiating Implicit and Explicit Theory of Mind and Associated Neural Networks in Clinical High Risk (CHR) Youth

Echiverri-Cohen, A., Young, K., Glazer, J., Perez, M., **Damme, K. S. F**., Chat, I., Kelley, N. J., Bookheimer, S., Nusslock, R., Zinbarg, R., Bilder, R., Craske, M. (under review) Response inhibition, extinction and extinction recall share an inhibitory regulation neural network.

In Preparation

Damme, K.S.F., Young, C. B., Kelly, N., Carroll, A., Nusslock, R., Black, C., Ng, T., Chein, J., Hamlatt, E., O'Garre, J., & Alloy, L (in prep) Bipolar Spectrum Disorders Show Region and Sex Specific Increases in Frontal and Striatal Gray Matter Volume.

Damme, K.S.F., Alloy, L. B., Black, C., Kelly, N., Ng, T., Titrone, M., Chein, J., Mohammad, F., & Nusslock, R., (in prep). Disrupted Structural and Functional Emotion Regulation Networks Relate to Risk for Bipolar Spectrum Disorders.

Black, C., **Damme, K.S.F.,** Nusslock, R., Chein, J., Hamlatt, E., O'Garre, J., & Alloy, L (in prep) Resting State Functional Brain Networks in Bipolar Spectrum Disorder: A Graph Theoretical Investigation.

Carroll, A., **Damme, K. S. F.**, Nusslock, R., Bart, C.P., Ng, T., Titone, M.K., & Alloy, L. B. (in prep) Emotion-Based Impulsivity and Prefrontal Cortical Volume Predict Risk for Bipolar Spectrum Disorders.

Armstrong, C., **Damme, K.S.F.,** Young, C. B., Nusslock, R., Ng, T., Chein, J., Hamlatt, E., O'Garre, J., & Alloy, L (in prep) A Comprehensive Examination of White Matter Tract Diffusivity in a Bipolar Behavioral High-Risk Design.

Ristanovic, I., **Damme, K.S.F.,** Mittal, V. (in prep) Sex-Specific Hormonal Effects on White Matter Integrity in the Clinical High Risk for Psychosis.

Chapter

Nusslock, R., & Young, C.B.*, Pornpattananangkul, N.*, **Damme, K.*** (2015). Neurophysiological and neuroimaging approaches to clinical psychological research. In R. Cautin & S. Lilienfeld (Eds.), *Encyclopedia of Clinical Psychology*. New Jersey: Wiley-Blackwell.

Popular Media/Press

Witkowski, S. (Producer) (2017) PhDrinking: Risky Business of Psychopathology with Katherine Damme [audio podcast]. https://soundcloud.com/phdrinking/the-risky-business-of-psychopathology

Gallagher, N. (2017) *Invisible Lines: An Interview with Katherine Damme and Kathleen Reardon.* http://www.sixbyeightpress.com/interview-katherine-damme-kathleen-reardon/

Research Training

2018-present	**Post-Doctoral Fellow,** Northwestern University Adolescent Development and Preventative Treatment Lab, Dr. Vijay Mittal
2013-2018	**Graduate Research Fellow,** Northwestern University Affective and Clinical Neuroscience Lab, Dr. Robin Nusslock (Primary Mentor) Adolescent Development and Preventative Treatment Lab, Dr. Vijay Mittal (Secondary Mentor)
2013	**EEG Research Assistant,** University of Nebraska- Lincoln Developmental Brain Lab, Dr. Dennis Molfese
2011- 2013	**Intramural Research Training Award (IRTA) Fellow,** NIMH Clinical Brain Disorders Branch, National Institute of Mental Health, Dr. Daniel Weinberger Genes, Cognition and Psychosis Program, Section on Integrative Neuroscience, Dr. Karen Berman
2009-2011	**MRI Research Assistant,** Vanderbilt University Psychiatric Hospital, Vanderbilt University Medical Center, Nashville, TN Neuropsychology Clinic, Dr. Michael Tramontana Affective Neuroscience Lab, Dr. David Zald
2008	**ThinkSwiss Research Fellowship,** École Polytechnique Fédérale de Lausanne (EPFL)-CHUV Clinical Neuroscience and Genetics Lab, Dr. Kim Do
2007-2009	**Undergraduate Directed Studies - MRI** Clinical Neuroscience, Vanderbilt University, Nashville, TN Dr. Sohee Park

Special Skills

Programming	Linux/Unix (Proficient), Matlab (Proficient), Excel (Proficient), and Python (Novice)
Statistical Software	R (Novice), SPSS (Proficient), SAS (Proficient), JMP (Proficient)
MRI Software	AFNI (Proficient), Freesurfer (Proficient), SPM (Proficient), FSL (Proficient), DSI Studio (Proficient), Tracula (Proficient), and Conn Toolbox (Proficient)
EEG Software	EEGlab (Novice), ERPlab (Novice)
Behavioral Software	EPRIME (Proficient), Presentation (Novice), Psychtoolbox (Novice), Tobii Eye Tracker (Novice)
MRI Techniques	DTI: tract-based statistics (Proficient), probabilistic tractography (Proficient), deterministic tractography (Proficient), diffusion based subsegmentation (Proficient), and graph theory analyses (Novice)
	Morphometry: volume-based analyses (Proficient), cortical thickness (Proficient), gyrification (Proficient), and shape analyses (Novice)
	fMRI: Task-based functional neuroimaging (Proficient), Task design (Proficient), Pairwise connectivity (e.g., PPI; Proficient), Resting-state connectivity (Novice), Resting-state graph theory analyses (Novice)
	Other: Simultaneous EEG-MRI (Novice), Simultaneous Peripheral Physiology - MRI (Proficient), Transcranial Magnetic Stimulation (Novice)

Current Projects

Diffusion-based subsegmentation of the amygdala across the bipolar risk spectrum. In this project, I extend the established literature regarding elevated amygdala in bipolar disorder to a behavioral high-risk population using subject specific amygdala volumes. Many studies have compared amygdala volume in bipolar disorders to major depression or schizophrenia, but the question remains as to whether amygdala volume precedes

bipolar onset or is related to treatment. Additionally, the amygdala is not a homogenous structure, but a collection of critical subnuclei. Each subnuclei has distinct anatomical connectivity and serves a distinct role in a larger network. It is possible that the elevated amygdala volume is consistent across subnuclei or is driven largely by particular subnuclei. To answer this question, I use the distinct anatomical features of each subnuclei to subsegment the volume.

Structural graph theoretical insight into early and distinct markers of bipolar spectrum disorders. A critical risk marker of BSD may be the composition and integrity of neural networks, particularly those involved in reward and emotion. However, no study has examined structural network architecture of BSD along a spectrum of risk. To address this second gap in the literature, I will use a graph theoretical approach to examine both structural network architecture implicated in BSD across three levels of analyses: (1) global network composition, (2) subnetwork composition (i.e. reward, emotion regulation), and (3) inter-network hubs. In line with existing literature, we expect that individuals with a BSD diagnoses will demonstrate distinct global network architecture. What remains unclear, however, is whether global features will be aberrant in behavioral high-risk for BSD. Additionally, we expect the examination of subnetworks will improve sensitivity to changes in BSD network structure.

Willing to wait and willing to work: The relationship of motivation to self-control. People tend to devalue rewards in proportion to the effort or time required to obtain them. Effort and temporal discounting are largely studied independent of one another, overlooking the possibility that these two discounting tendencies may interact or reflect individual differences executive function. During the delay discounting task participants made hypothetical choices pitting an immediate reward against a delayed but more valuable reward. Effort discount was measured with a behavioral choice paradigm pitting small rewards requiring minimal physical effort against larger reward requiring considerable physical effort. The aim of these analyses is to understand the unique and shared individual variance of willingness to wait and willingness to work for reward, and whether these traits may reflect sensitivity to reward or executive control.

Cortical Morphometry Provides New Evidence of a Stress-Diathesis Model in Ultra High Risk for Psychosis. Psychotic disorders are widely characterized by abnormal cortical features including thinning and hypo/hyper gyrification, spanning a range of functionally relevant areas. Interesting, specific cortical surface characteristics may be highly informative about timing of developmental insult or specific pathogenic factors. Features such as aberrant gyrification are linked to abnormal connectivity in utero, and features such as cortical thickness are tied more directly to brain development in adolescence. While both sets fit with prominent etiological conceptions around connectivity, to date, efforts to reconcile this substantial literature with neurodevelopmental models have been limited. The surface abnormities are present in psychosis may have occurred after onset, reflecting neuro degeneration/toxicity/response to medication, or changed as a function of earlier illness progression. While many studies associate psychosis prodrome with surface abnormalities, it is currently unclear is if these abnormalities were carried over from infant development, or if in fact, emerged/changed during the significant adolescent neuro-reorganization in the psychosis prodrome period. To date, there are only a handful of studies in individuals at ultra high-risk for psychosis that do focus on change over time. Furthermore, there have been very few to examine cortical features over two-time points. Finally, no studies that have looked at cortical thickness in conjunction with gyrification in the same sample, over time. This information will play a vital role in helping to reconcile the body of literature highlighting cortical feature anomalies in psychosis, with the neurodevelopmental perspective of schizophrenia.

Simultaneous EEG-MRI Examination of the Monetary Incentive Delay Task. Reward sensitivity EEG and fMRI literatures are largely siloed into parallel literatures. These literatures depend on existing aggregate constructs (e.g., ERPs or fMRI contrasts) which have not been directly related. Examining the relationships between well-studied EEG constructs- such as the RewP ERP- to well-studied fMRI contrasts would serve as a basis to integrate these literatures. Additionally, we will model EEG and fMRI as simply electrophysiological and metabolic models of the same underlying brain states on different time/spatial scales. By considering two measures of the same distributed neural system, we can generate a joint model of the underlying brain state using a joint ICA approach, to fully capture the precise spatial and temporal features of the reinforcement learning network activity. I hypothesize that traditional aggregate measures of fMRI and EEG will provide similar information, i.e., will be highly related, across the methodologies. I also hypothesize that each methodology can provide unique and complimentary information in a data driven approach. While aggregate measures are sure to catch engagement of the larger network in general, I expect that the ICA may capture dynamic features of reinforcement learning states (e.g. initial reactivity and habituation to reward responses) may change over time.

Mentored Undergraduate Students

Undergraduate Student Mentees

Rita Taylor (mentored 2013-16): Psychology and Cognitive Science Majors; 2016-18: Research Assistant (PI: Susan Bookheimer); Graduate student of Clinical Psychology Wash-U (PI: Deanna Barch)
Ajay Nadig (mentored 2013-17): Neuroscience Major; 2017-19: NIMH IRTA (PI: Armin Raznahan)
Laura Padilla (mentored 2015-17): Neuroscience Major; 2017-19: NIMH IRTA (PI: Peter Schmidt)
Wan Kwok (mentored 2015-17): Neuroscience Major; 2017-19: NIMH IRTA (PI: Chris Baker)
Virginia Hoch (mentored 2014-17): Psychology and Biology Major; 2017- current: Medical Student (MD/MPH; Feinberg Medical School)
Michael Weston (mentored 2015-18): Neuroscience Major; Economics Minor; Investment banking analyst with Houlihan Lokey in Minneapolis (2018)

Mentored Undergraduate Projects

'Paths to Mania: Structural Connectivity Underlying Reward Sensitivity in Bipolar Disorder (Senior Thesis)', Northwestern Education and Undergraduate Research on Neuroscience Program (NEURON), Wan Kwok

'Uncinate Fasciculus as a Developmental Biomarker of Impaired Cognition and Mood', Northwestern Education and Undergraduate Research on Neuroscience Program (NEURON), Laura Padilla

'Using Joint-ICA to Parse Spatiotemporal Features of Reward Processing in Simultaneous EEG-fMRI', Northwestern Education and Undergraduate Research on Neuroscience Program (NEURON), Ajay Nadig

'Structural Connectivity Underlying Reward Sensitivity in Bipolar Disorder', Northwestern University, Undergraduate Research Grant, Wan Kwok

'Modeling cortical morphometry in bipolar disorder: a dynamic insight into psychopathology', Bioscientist Research Grant, Michael Weston

Departmental Service

Graduate Teaching Fellow (2016-17): Graduate Teaching fellows work to address specific learning and teaching needs in their department and assist with the facilitation of grad and postdoc programming at Searle Center for Teaching Excellence. I attempted to bridge a training gap from guest lecturing to full course planning. I organized multi-day workshop series (no less than 2 days and no more than 4 days), to enable graduate students to have generate a smaller scale course with support and feedback of a graduate teaching fellow. The outcome for the students involved will generate documents for a teaching portfolio (workshop plans, teaching observation, and feedback), experience building course structure with feedback and support, and follow up meeting providing debriefing and future directions for teaching approaches.

Psychology Graduate Student Committee (2014-16): I served on a graduate committee tasked with generating initiatives to: build and maintain a sense of community within the department (e.g., maintaining the mentorship program, organizing social events), act as a resource for graduate students and promote information sharing (e.g., maintaining ARES, organizing professional development events), and advocate - be a voice for the graduate students and increase transparency/accessibility to faculty and TGS (e.g., getting students on search committees, organizing town hall meetings).

Graduate Leadership and Advocacy Council (2014-2016): We bring graduate students' concerns to the attention of the deans and administrative staff of The Graduate School (TGS) on both campuses. We give graduate students opportunities to participate in decision-making processes at Northwestern. Our efforts have resulted in services and policies that improve graduate student quality of life; from ensuring a livable wage, addressing health care restrictions, and providing public transportation access (U-Pass).