

Undergraduate Research Symposium May 19, 2017 Mary Gates Hall

Online Proceedings

POSTER SESSION 1

Balcony, Easel 96

11:00 AM to 1:00 PM

Diary Card Skill Used in Relation to Self-Harm Urge

Cho Yoonhee (Cho) Cory, Senior, Psychology

Shiyu (Evelyn) Tang, Senior, Economics, Psychology

Soyeon Jung, Junior, Psychology, English

Mentor: Kevin Kuehn, Psychology, Behavioral Research & Therapy Clinics

Mentor: Marsha Linehan, Psychology

Dialectic Behavioral Therapy (DBT) is a treatment specifically developed for individuals diagnosed with Borderline Personality Disorder (BPD). DBT has been found to be effective in treating BPD related suicidality, substance use, and eating disorders. The weekly diary cards are one of the most essential components of DBT. Diary cards are a paper based standardized self-monitoring tool that can facilitate therapists in tracking the progress of clients in between therapy sessions. Previous studies have established many advantages of diary cards, such as its higher client retention rate than that of group-based DBT sessions. A typical diary card records the degree of urges for maladaptive behaviors such as self-harming, as well as the DBT coping skills the client has used for each day of the week. This current project strives to examine the potential correlation between weekly mean self-harm urge scores and number of skills used by examining diary cards from multiple previous DBT clients. It is speculated that increased self-harm urge level is related to decreased coping from clients. The result of this correlation study might warrant a full-scale randomized control trial on this subject matter to locate potential causation. This current project also strives to answer whether certain skills are highly related with self-harm urge, as previous studies indicated that some skills were used more than others by DBT clients. Correlation obtained here may serve to develop behavior-specific coping skills.

SESSION 1D

ECOLOGY AND EVOLUTION

Session Moderator: Bonnie Becker, Environmental Science (Tacoma)

MGH 234

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Non-Native Predator Impacts on North Coast Olympic Mudminnow (*Novumbra hubbsi*)

Amaryllis Adey, Senior, Aquatic & Fishery Sciences

Mary Gates Scholar

Mentor: Julian Olden, Aquatic & Fishery Sciences

Mentor: Lauren Kuehne, School of Aquatic and Fishery Sciences

Olympic mudminnow (*Novumbra hubbsi*), Washington's only endemic fish species, was listed as "Sensitive" at the state level in 1999. However, limited knowledge and understanding has stalled conservation efforts. This study investigates the impact of invasive fishes on Olympic mudminnow, focusing on Lake Ozette in Olympic National Park. Using stable isotopes from the species present in Lake Ozette, the trophic ecology of mudminnow was determined. Stable isotopes are naturally occurring and can be used to trace the pathways of aquatic- and terrestrial-derived energy and carbon transfer in aquatic ecosystems. This analysis method investigates carbon (^{13}C , ^{12}C) and nitrogen (^{15}N , ^{14}N) found within samples. The presence of these isotopes depends on what a species eats. Moving up the food chain, the ratios of $^{13}\text{C}/^{12}\text{C}$ and $^{15}\text{N}/^{14}\text{N}$ increase, identifying a species' feeding position within a community. The higher the trophic position, the more ^{13}C and more ^{15}N will be present in the sample. Through analysis of the entire community, including fish, invertebrates, and plants, a generalized food web was constructed for Lake Ozette. Using linear models and a permutation method, the fish species were compared to the model to test for statistically significant differences between the measured ratio of carbon to nitrogen. If the position of the fish species was significantly different from the model prediction, then there is no niche overlap and competition is unlikely. The combined results of the stable isotope and spatial overlap analyses indicated which species impact Olympic mudminnow within Lake Ozette. This study provided key

information concerning complex predator-prey interactions, which must be understood to manage Olympic mudminnow as well as the invasive species present in Lake Ozette. Since there is little known concerning this species, there are many opportunities to extend the knowledge base continuing both with the predator prey interactions and with other knowledge gaps.

SESSION 1I

MCNAIR SESSION - EXPLORING SCIENCE FROM CELLS TO EXOPLANETS

Session Moderator: *Janneke Hille Ris Lambers, Biology*
MGH 254

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Understanding the Role of Replication Protein A 1E in the Immune Response of *Arabidopsis thaliana* Against a Microbial Pathogen

Sherlee Alvarez, Junior, Biochemistry, Molecular and Cellular Biology, Univ New Hampshire

McNair Scholar

Mentor: Kevin Culligan, Univ New Hampshire

Understanding the mechanisms of plant biotic defense is imperative to help decrease agricultural crop damage by pathogens. Pathogens can potentially enhance infections by inducing DNA damage within the host. One example is DNA double-strand breaks caused by *Pseudomonas syringae*, a common bacterial pathogen in plants. Plants encode various mechanisms to repair double-strand breaks, including a pathway called homologous recombination repair that is regulated by the protein complex RPA (Replication Protein A) in response to abiotic stress. We further hypothesize that RPA plays a central role in regulating repair of pathogen-induced double-strand breaks. To test this, we will quantify hypersusceptibility of mutant lines of *Arabidopsis thaliana* in response to pathogen infection (*P. Syringae*), employing a plant infiltration assay. This assay involves whole plant infiltration, followed by measurement of CFU counts of persisting bacteria within the leaf tissue. Of particular interest in this study is the role of one subunit of RPA, termed RPA1E, since mutants of the encoding gene display strong hypersensitivity to agents that induce double-strand breaks. Our current results suggest other RPA subunits (RPA1C) display hyper-susceptibility to pathogen infection. These results will ultimately provide initial insight in how agricultural crops defend themselves from microbial invasion by determining whether RPA1E responds to a pathogen infection and if it is required in the defense response of *A. thaliana*.

POSTER SESSION 2

MGH 241, Easel 125

1:00 PM to 2:30 PM

Heterogeneous Coating of Reduced Graphene Oxide and Polydopamine on Nanostructured Substrates Using Dopamine Chemistry

Evan Jihong (Evan) Lam, Senior, Chemical Engineering

Mentor: Deok-Ho Kim, Bioengineering

Mentor: Kevin Gray, Bioengineering

The use of graphene in nanoscale systems serves many applications not only in solar cells but also in biomaterials because of the combined optical, electrical, and structural properties. Conventional methods including chemical vapor deposition and electrospraying to produce a layer of graphene on nanostructures is costly. Reduction of graphene oxide using chemical reagents presents an easier and cheaper alternative while maintaining the unique properties of graphene. But these methods are typically solution-based and further steps must be taken to coat reduced graphene oxide onto nanostructured surfaces. Dopamine chemistry was applied in a simple simultaneous approach of self-polymerization to reduce graphene oxide while creating an adhesive to incorporate a heterogeneous coating of polydopamine and reduced graphene oxide on a nanostructure. Use of various concentrations of graphene oxide demonstrated control over the sample's surface conductivity profile. Surface analysis characterizations confirmed the presence of the coating through X-ray photoelectron spectroscopy (XPS) while the electrical properties were determined using conductive atomic force microscopy (cAFM). The overall topographical morphology will be confirmed with atomic force microscopy (AFM). A potential application of the proposed device serves to provide functionally and structurally mature human pluripotent stem-cell derived cardiomyocytes (hPSC-CMs) for use in research and clinical drug trials.

POSTER SESSION 2

MGH 241, Easel 139

1:00 PM to 2:30 PM

Antidepressant Effects of Inhibiting Lateral Habenula Output Pathways Using DREADD Technology

Paige Bartlett, Junior, Neurobiology

Mentor: John Neumaier, Psychiatry

Mentor: Kevin Coffey, Psychiatry and Behavioral Science

The lateral habenula (LHb) is a structure in the epithalamus that encodes aversive states and accumulating evidence indicates that the LHb exhibits hyperactivity during depressive-like states. Previously, we have shown that inhibition of the LHb using Gi-coupled designer receptors exclusively acti-

vated by designer drugs (DREADDs; hM4Di) can produce antidepressant effects. The LHB is known to project to several midbrain nuclei, including the ventral tegmental area (VTA), the rostral medial tegmental nucleus (RMTG) and the dorsal raphe nucleus (DRN). In this study, we seek to determine which lateral habenula output pathway may give rise to the previously observed antidepressant effect in rats. We are separately testing inhibition of the three output pathways of the LHB to the VTA, RMTG and DRN, using intersectional expression of a floxed hM4Di-DREADD in LHB neurons that project exclusively to these target regions. Using stereotaxic surgery, an AAV viral vector containing floxed-hM4Di is infused into the lateral habenula of a rat, while CAV2-CRE is injected into the respective target region. CAV2-CRE travels retrograde up the axons of neurons and produces the CRE-enzyme, allowing DREADD expression to be restricted to neurons that project from the LHB to each respective target region. After a recovery period, rats are either administered Clozapine-N-Oxide (CNO), which activates the DREADDs, or a control vehicle, and then undergo the modified forced swim test (FST), which is a validated behavioral measure of antidepressant effects in rats. High escape behavior in the FST indicates anti-depressant effects. After experimental testing, the rats are sacrificed and their brains examined histologically to confirm expression of the DREADDs within each pathway. By identifying which LHB pathways confer an antidepressant effect, this research could lead to future treatments of depression that act directly on those pathways.

SESSION 2F

POLITICS AND CULTURE

Session Moderator: John Wilkerson, Political Science

MGH 242

3:30 PM to 5:15 PM

* Note: Titles in order of presentation.

Populism, Deindustrialization, and Resentment: The Political Economy of Trump & Brexit

Tyler James (Tyler) Pichette, Senior, Political Science

UW Honors Program

Mentor: James Caporaso, Political Science

Mentor: Frank Wendler, Department of Political Science

Mentor: Kevin Aslett, Political Science

This paper aims to explain how both the Donald Trump campaign for President of the United States and the Leave campaign in support of Brexit achieved national electoral success. Both stunning political victories initially shocked global markets and people across the world alike. In this paper, I aim to understand their electoral successes within the broader context of growing populist, nativist, and isolationist sentiments in western democracies. I argue that both the Trump

campaign and the Leave campaign mobilized broad feelings of resentment in white, economically stagnant, deindustrialized communities scattered across their respective countries to augment their bases, build their political coalitions, and achieve electoral success. I rely mostly on qualitative methods and some quantitative data to conduct rigorous case studies on different British and American communities with the presence of deindustrialization serving as the independent variable. I intend for these case studies to show that the combination of deindustrialization and lingering effects of the global recession in predominantly white communities led to increased susceptibility to populist appeals to feelings of economic resentment. Further, in economically dynamic but demographically comparable cases where deindustrialization is not present, the same populist appeals were substantially less successful. The key implication of my work is it demonstrates the saliency of populist, nativist, and isolationist political appeals to white voters in deindustrialized communities in western democracies, and the ability to build a successful political coalition based off feelings of resentment and economic anxiety.

SESSION 2K

PSYCHOLOGICAL AND INTERPERSONAL FUNCTIONING

Session Moderator: Todd Herrenkohl, Social Work

MGH 271

3:30 PM to 5:15 PM

* Note: Titles in order of presentation.

The Relationship between Interpersonal Functioning and Suicidality among a High-Risk for Suicide Sample

Jiwon Jung, Senior, Psychology

UW Honors Program

Mentor: Marsha Linehan, Psychology

Mentor: Kevin Kuehn, Psychology, Behavioral Research & Therapy Clinics

The Diagnostic and Statistical Manual of Mental Disorders V (DSM V) characterizes Borderline Personality Disorder (BPD) as impairments across social functioning (e.g., an inadequately developed, unsteady self-image and constant conflict in relationships) and personality traits (e.g., negative affectivity, rejection sensitivity, impulsivity, and hostility). Because of these impairments, people with BPD frequently encounter serious problems such as emotion dysregulation and suicidality. Emotion dysregulation is defined as a lack of emotional comprehension, inability to cope with emotions in adaptive ways, and unacceptance of distress as part of goal accomplishment, and the lack of ability to pursue a goal in distress. Self-injurious behaviors (SIB), which captures both suicide and non-suicidal self-injury (NSSI), is also an issue

to note for people diagnosed with BPD, because they are at higher risk for SIB. It is evident that emotional dysregulation and suicidality are clear disturbances to having a balanced, healthy life. The study pertains to investigate the relationship among emotion dysregulation, rejection sensitivity, and SIB across the patients' treatment timeline. We first hypothesize a direct relationship between emotion dysregulation and SIB; prior research suggests that diagnosis of BPD will increase the likelihood of suffering from emotion dysregulation and SIB respectively. This is crucial, because it tests the theoretical model of the relationship between the two variables. Our second hypothesis aims to take a scope at how rejection sensitivity exerts a mediator effect on the relationship between emotion dysregulation and SIB among individuals diagnosed with BPD. We conjecture that higher rejection sensitivity will strengthen these two relationships. The study recruited 99 females diagnosed with BPD to assess their emotion dysregulation, rejection sensitivity, and SIB. Based on the analyses, we expect to provide an empirical support for the theoretical model and encourage future research to better promote health for individuals diagnosed with BPD.

a day including items from the Perceived Stress Scale and the UPPS Impulsive Behavior Scale. In analysis, we test the relationship between stress levels and levels of impulsivity, and examine negative affect as a possible mediating variable. We have also hypothesized a threshold relationship in which stress will only predict impulsivity if it exceeds a sufficient level, and will structure statistical analyses accordingly.

POSTER SESSION 4

Balcony, Easel 88

4:00 PM to 6:00 PM

Impulsive Behavior as a Strategic Coping Response to Stress and Negative Mood

Natalie Frolund (Natalie) Upton, Senior, Psychology

Mary Gates Scholar

Mentor: Kevin King, Psychology

Accumulating evidence supports the idea that stress and emotion are crucial in appraisal of situations and in deciding coping processes. Additionally, negative moods have been shown to increase the likelihood of engaging in self-defeating behavior such as impulsive acts. Despite the breadth of research into psychological stress responses and impulse control as a facet of personality, limited attention has been given to a possible link between the two constructs. As a connection between stress and impulsivity may have adaptational consequences, it has prompted new research questions about the role of stress and emotion and how they implicate coping responses. Evidence for impulsivity as a possible coping response is supported by a 'priority shift' theorized by researchers, in which an individual chooses to engage in impulsive behavior to attain immediate gratification, thereby shifting their attention from long-term to short-term goal pursuit. This coping response may be motivated by a demand for mood repair. A 10-day Ecological Momentary Assessment (EMA) style survey is used in conjunction with a baseline questionnaire to assess college students' responses to stressors and negative mood. Data are from a sample of 100 UW students aged 18-20. Participants answer three surveys