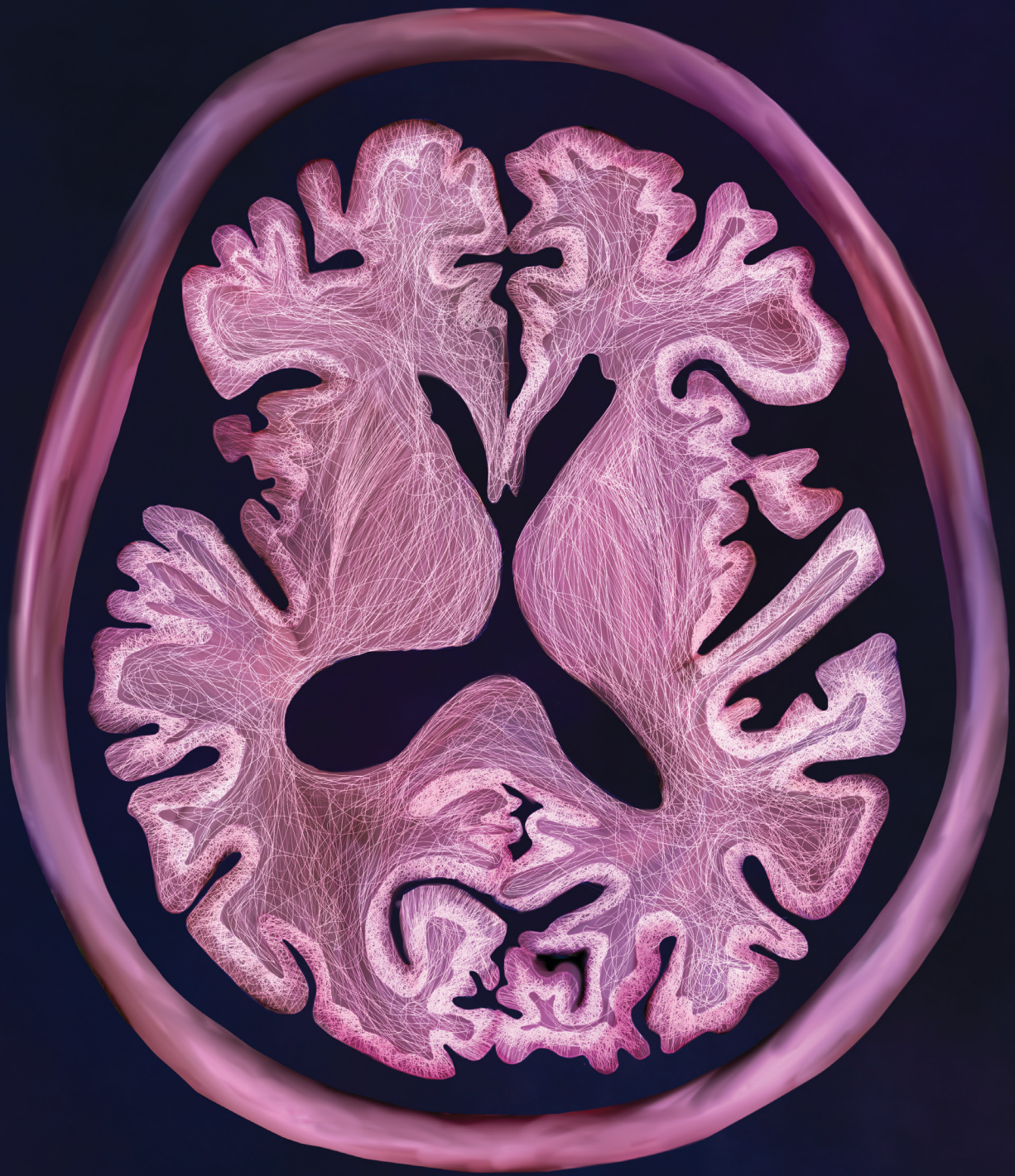
Psynapse

McMaster Undergraduate Journal of Psychology, Neuroscience & Behaviour



ACKNOWLEDGEMENTS

The Psynapse team would like to thank some key individuals who helped us navigate the obstacles of creating the inaugural publication of the Psynapse, which has, in turn, led to what you are viewing today. These are individuals from on- and off-campus including faculty, librarians, and legal services. We would like to thank them for their expertise in assisting our publication.

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Issue 3

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Letter From The Editor

Dear Psynapse Reader,

It is my pleasure to present you with the third issue of Psynapse: McMaster Undergraduate Journal of Psychology, Neuroscience & Behaviour. Within the pages of this journal, we present you with some of the best of undergraduate research in Psychology, Neuroscience, and Behaviour.

These past several months have led to yet another successful issue of the Psynapse Journal. From expanding our team to expanding our reach to the University of Toronto and the University of Waterloo, this year has been a time of growth, creativity, and new initiatives.

Every individual on this year's executive team has my deepest thanks and gratitude. Despite the hardships we faced, the passion and infinite patience of the Psynapse executive team propelled us forward and through all obstacles.

To the editorial and design teams - the third issue of this journal would not have materialized if it weren't for your unfathomable brilliance and determination, of which I am in awe. It has been an absolute pleasure. In the same manner, I would like to express my sincerest thank you to the authors and contributors of this issue. The success of this issue is a testament to not only the outstanding efforts of this year's team, but also my predecessors Dayle Parker and Kathy Jiang.

For the budding researcher, we hope this journal will inspire you to pursue the path of those published here. For the curious reader, we hope that Psynapse will further your interest in the varied and dynamic disciplines of Psychology, Neuroscience, and Behaviour.

Fairuz Karim

Fairuz Karim
Editor-in-Chief 2019-2020

Advanced Topics

The Advanced Topics section contains scientific papers that paint a nuanced portrait of an emerging or controversial topic in Psychology, Neuroscience & Behaviour (PNB). Whether made from the author's own research or produced for a class, the papers in this section allow the readers to delve deep into emerging topics in PNB without sacrificing clarity. We hope this section succeeds in inspiring readers to critically analyze and explore these various topics.

Active Procrastination: A New Option for Academic Success

Article Collaborators

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Miyamoto adopts a unique habit during his exam: he waits until two-thirds of the exam time passes before he begins answering questions. As Miyamoto starts with two-thirds less time than his cohorts, he must think three times as fast as others. This limited time forces him to engage in "thought acceleration", whereby his processing speed increases over time (Chu & Choi, 2005). Although Miyamoto is the last one to start an exam, he always aces it. Engaging in a process known as Active procrastination, Miyamoto intentionally postpones starting his exams in pursuit of intense pressure. Active procrastination refers to intentional procrastination (Chu & Choi, 2005). With cognitive efficiency and adrenaline production as motivation to engage in active procrastination, active procrastinators achieve satisfactory grades. Many students adopt active procrastination (Cao, 2012; Chu & Choi, 2005).

Active procrastinators intentionally postpone work. The demands of university life often force students to procrastinate. Heavy course loads and frequent social events combine to occupy student's lives — often leads to last-minute cramming. In fact, over 70% of university students admitted that they regularly procrastinate (Schouwenburg, 1995). However, not all students procrastinate for the same reason, or achieve the same results. Procrastination can be either passive or active. Passive procrastinators are traditional procrastinators: they aimlessly drift from one activity to another (Bond & Feather, 1988; Chu & Choi, 2005). Poor time-management skills lead to passive procrastination, therefore, they compel passive procrastinators to engage in last-minute cramming. In contrast, active procrastinators prefer the intense pressure of cramming. They believe they work better under pressure. Limited time motivates them to complete the task before the deadline (Corkin et al., 2011). The benefits of pressure encourage active procrastinators to intentionally delay their work. Miyamoto does not delay starting his exams because of poor time management. Instead, he recognizes and exploits the value of pressure—pressure motivates him to complete his test by the deadline.

Active procrastination motivates students to meet deadlines. Two independent factors influence an active procrastinator's speed of thought: cognitive efficiency, maximizing learning in a minimal amount of time; and adrenaline production. A belief in "putting off a task for better thinking" predisposes students to delay their work as a form of strategic planning (Cao, 2012; Schraw et al., 2007). Students who plan ahead can mull over potential difficulties before they begin to work. Procrastinating shortens the time required of the work, increasing cognitive efficiency (Schraw et al., 2007). Active procrastinators, therefore, think more fluently as they start their tasks. Adrenaline also increases the speed of thought (Sissons, 2018). During last-minute cramming, active procrastinators experience an increase in adrenaline production. Adrenaline serves as an elixir to create a surge in energy.

This elevated energy exhilarates active procrastinators, motivating them to complete their tasks on time (Bergland, 2012). Working under a test deadline enables Miyamoto to think faster by increasing cognitive efficiency and adrenaline release. As a result, Miyamoto always finishes his tests before the bell rings, and this fast speed of thought helps ace all of his exams.

Active procrastinators achieve satisfactory grades. However, procrastination is considered as an impediment to academic success (Hen & Goroshit, 2014). Society tends to believe students who procrastinate usually receive low grades (Tice & Baumeister, 1997), but this conclusion usually applies to passive procrastinators (Chu & Choi, 2005). Although many studies equate procrastination with poor academic performance, not all delays induce negative outcomes. For instance, active procrastinators perform better in creative tasks (e.g. writing assignments) (Liu et al., 2017). Active procrastinators have high creative self-efficacy (CSE), the confidence in their ability to succeed in creative tasks. (Corkin et al., 2011; Lindt et al., 2014). High CSE improves creative ideation performance (Liu et al., 2017). Creative ideation is the cognitive ability to produce many creative ideas, and is often used interchangeably with the term brainstorming (Liu et al., 2017; Nijstad et al., 2010). In other words, active procrastinators are good at brainstorming due to high CSE. Brainstorming improves critical thinking and creative thinking skills (Yunus et al., 2012). These two determinants hatched from brainstorming elevates an active procrastinator's writing to a higher level and thus leads to a higher grade (Liu et al., 2017; Yunus et al., 2012). The higher academic grades (Chu & Choi, 2005; Corkin et al., 2011) achieved by active procrastination challenges the traditional bias against procrastination. Understanding how active procrastination affects academic progress may shed more light on its the benefits.

Active procrastination benefits students in academic success. Students gain motivation through active procrastination. This motivation then integrates cognitive efficiency and adrenaline to accelerate the speed of thought. By thinking faster than others, active procrastinators not only complete their tasks before the deadlines, but also achieve satisfactory grades. In a nutshell, although active procrastinators postpone their work, they achieve maximum results with less time. The story of Miyamoto illustrates how he obtains remarkable academic achievements. While, his test strategy is not one that should be broadly recommended (due to the high risk of delaying an actual test), his legendary story deserves some considerations in educational practice. For many students, active procrastination serves as a viable option for academic success.

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Calcium Indicator for Imaging of Neural Activity

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The human brain is one of the most mysterious and complex organs. Composed of more than a trillion neurons, it is a wonder as to how it works (Purves, 2011). The development of new techniques and tools has been essential to understanding the structure and the function of the brain (Purves, 2011). One foundational goal of neuroscience has been to reliably map activity in individual neurons and neural populations. However, doing so has proven to be uniquely difficult as available technologies are limited in their ability to map brain activity with high spatial and temporal resolution. Thus, despite the fundamental role of action potentials, neurotransmitters, ions and second messengers in neuronal physiology, high-resolution imaging of neural cell activity has been challenging (Knöpfel & Boyden, 2012).

Fortunately, some progress has been possible due to the concurrent development of fluorescence microscopy imaging and fluorescence protein indicators. However, developing effective indicators has proven challenging. Currently, calcium (Ca2+) based indicators have been the most successful (Looger & Griesbeck, 2012).

Ca2+ ions are ideal targets for fluorescent indicators due to their fundamental roles in neural signalling. Intracellular Ca2+ levels are controlled by voltage-gated calcium receptors, and ionotropic glutamate receptors (Grienberger & Konnerth, 2012). In the presynaptic terminal of the neuron, Ca2+ influx mediates exocytosis of neurotransmitters. In the postsynaptic neuron, Ca2+ levels increase during activity-dependent synaptic plasticity in dendritic spines. In addition, Ca2+ activity provides strong detection signals: intracellular Ca2+ concentration is 50–100nM at rest and increases 10-100 fold during electrical activity (Grienberger & Konnerth, 2012).

Most calcium indicators consist of a fluorescent protein bound to calmodulin, a Ca2+ transport protein, and various peptides. While older fluorescent Ca2+ indicators have been developed and used for in vivo imaging for decades, advancements in technology have led to the development of genetically encoded Ca2+ indicators (GECIs). Through the transfection of modified viral DNA, neurons are able to directly translate their own Ca2+ indicators. This removes the need to introduce indicators through invasive methods such as dye loading (Looger & Griesbeck, 2012). Furthermore, the genetic regulation of the indicators allows for specific subcellular targeting and long-term expression. This allows for high-quality microscopy imaging throughout the processes of development, learning and plasticity (Chen et al., 2013).

Early GECIs had difficulty detecting single action potentials due to the high affinity of Ca2+ to calmodulin, which would distort the mapping of cal-

cium dynamics. However, continuous refinement of GECI proteins has addressed this issue (Helassa et al., 2016). For instance, researchers recently manipulated variants of GCaMP, a popular family of GECIs. Variants of GCaMP6 were created using mutagenesis to target the R-20 peptide in calmodulins's Ca2+ binding site. In the newly created GCaMP6s and GCaMP6f, lowered Ca2+ affinity resulted in a fluorescent rise and decay of 1 and 3 milliseconds respectively, which is suitable for detecting individual action potentials (Helassa et al., 2016).

One of the most significant implications of Ca2+ indicators relates to the Human Connectome Project (HCP). The HCP attempts to comprehensively map the neural pathways that underlie human brain function (Dance, 2015). Ca2+ indicators have the potential to further our understanding of the human brain by providing temporally accurate activity snapshots of brain circuits (Fosque et al., 2015). In comparison to older techniques, Ca2+ indicators are able to label neural populations during behavioural change, drug treatment, and sensory stimulation (Fosque et al., 2015). Using such advancements in research, the HCP will provide insight into neural connection topology (Sporns, 2012).

As improved GECIs are developed, higher resolution in vivo imaging will further uncover functional neural networks and shed light on abnormal brain circuits in neurological and psychiatric disorders. In the future, Ca2+ imaging can be applied to various disease models to advance molecular medicine. Novel technology could allow for imaging in live humans, elucidating the dynamic and ever-changing nature of the human brain (Grienberger and Konnerth, 2012).

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Clinical Applications of Art

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Society classifies individuals as either 'artistic' or 'non-artistic'. This dichotomous way of thinking prevents perceiving art as a universal form of expression. Art is not only a product for viewer appreciation, but a process for artists to express intangible feelings and emotional experiences. As psychologists have observed therapeutic effects of creative self-expression, clinicians have started using artistic therapies for treatment of Posttraumatic Stress Disorder (PTSD). Art therapy entails using artistic mediums to express emotions and internal distress, thereby alleviating PTSD symptoms (Schouten, van Hooren, Knipscheer, Kleber, & Hutschemakers, 2019). However, to justify art therapy as a standard universal PTSD treatment, further empirical studies must be conducted (Schouten et al., 2019). Until date, art therapy in clinical trials have only been associated with positive outcomes—attesting to art therapy's promising approach. Hence, art therapy innovatively treats PTSD.

Traditional interventions fail to holistically treat PTSD. Standard treatments include cognitive processing therapy (CPT), prolonged exposure (PE), and eye movement desensitization and reprocessing (EMDR) (Wisco, Marx, & Keane, 2012). These interventions share the element of imaginal exposure, during which patients verbally describe their traumatic memories. However, PTSD patients struggle with this task as traumatic memories are stored nonverbally (Campbell, Decker, Kruk, & Deaver, 2016). The inability to address nonverbal memories explains why some PTSD patients fail to respond to traditional interventions (Wisco et al.,2012). Even individuals that are responsive to traditional interventions experience symptoms post-treatment that will inhibit patient satisfaction (Riggs & Sermanian, 2012). The inherent limitations of traditional PTSD interventions prevent holistic rehabilitation and recovery.

Art therapy resolves traditional PTSD treatment limitations. Unlike traditional interventions, art therapy targets nonverbal memories by engaging in the patient's senses (Campbell et al., 2016). Sensory engagement helps the patient retrieve sensory elements of nonverbal memories, allowing the patient to better understand and thus process their trauma (Gantt & Tinnin, 2009). This allows for the alleviation of PTSD symptoms. (Lyshak-Stelzer, Singer, St. John, Chemtob, 2007). While traditional treatments can reduce PTSD symptoms, patients find exposure-based methods unpleasant; exposure therapy forces PTSD patients to unwillingly confront triggering situations (Backos & Mazzeo, 2017). In contrast, the calmer atmosphere of art therapy allows patients to feel comfortable sharing their traumatic experiences (Palmer, Hill, Lobban, & Murphy, 2017). Consequently, patients prefer and will report higher satisfaction with art therapy over standard PTSD interventions (Campbell et al., 2016). High satisfaction promotes both high demand and retention in therapeutic art programs, demonstrating art therapy's clinical feasibility as a PTSD treatment (Schouten et al., 2019).

Art therapy complements traditional PTSD interventions. Integrating art therapy into traditional PTSD interventions improves likelihood of treatment success through minimizing complica-

tions. While clinicians often encounter disruptive behaviours during traditional PTSD interventions, interruptions rarely occur during art therapy sessions (Lyshak-Stelzer et al., 2007). Consequently, integrating art therapy into traditional interventions does not create new management problems for clinicians. Proper management of an integrated intervention program optimizes treatment effectiveness in alleviating PTSD symptoms. One program that integrated art therapy into cognitive-behavioural therapy (CBT) alleviated concurrent depressive and PTSD symptoms in childhood sexual abuse victims (Becker, 2015). In another program, PTSD patients demonstrated greater willingness to participate in combined art therapy and acceptance and commitment therapy (ACT) compared to traditional interventions alone (Backos & Mazzeo, 2017). The greater willingness to participate was attributed to ACT's ability to target avoidance coping mechanisms, and to art therapy's calm atmosphere (Backos & Mazzeo, 2017). The combined effects of art therapy and traditional interventions support holistic recovery, making it effective in treating PTSD.

Art-based treatment approaches advance the field of clinical psychology. Art therapy's innovative method, high patient satisfaction, and clinical feasibility amongst PTSD patients substantiates art therapy as a beneficial adjunct to traditional approaches in holistic treatment. Although adhering to traditional approaches is common practice, clinicians face inherent limitations and patient dissatisfaction; clinicians are beginning to realize that conventional treatments are not enough. The shortcomings associated with conventional therapies can only be overcome by exploring new approaches to treating psychopathology. Creative approaches to therapy often face reluctance because of their seemingly large deviations from traditional approaches. However, scientific advancements require creativity. Creative thinking triggered the clinical exploration of integrating art therapy into ACT, which proved highly effective in holistically treating PTSD patients (Backos & Mazzeo, 2017). In consequence, art-based treatment approaches embrace this creativity and are a necessary positive step towards improving treatment of psychopathology.

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C-Reactive Protein: A Biomarker for Bipolar Disorder

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An accurate diagnosis is a critical starting point for psychiatric treatment. However, bipolar disorder (BD) can be difficult to distinguish from major depressive disorder, also described as unipolar depression (UD), for several reasons (Almeida, Versace, Hassel, Kupfer, & Phillips, 2010; Phillips & Swartz, 2014). Diagnoses are often based off of a physician's interpretation of a clinical interview, which can be inaccurate (Singh & Rajput, 2006). Furthermore, BD patients are more likely to seek treatment during their depressive episodes as they are generally longer, more frequent, and more distressing than manic or hypomanic episodes (Angst et al., 2011; Singh & Rajput, 2006). Consequently, diagnosing individuals with bipolar disorder is challenging, and nearly half are originally misdiagnosed with depression (Bowden, 2005).

An incorrect diagnosis of BD not only delays appropriate treatment; it can also worsen symptoms if physicians prescribe incorrect medication (Singh & Rajput, 2006). Patients who are misdiagnosed as having UD are often prescribed antidepressants, such as selective serotonin reuptake inhibitors, or SSRIs. These drugs work by both blocking serotonin transporters (5-HTT) and increasing the levels of the neurotransmitter serotonin (5-HT) available in the synaptic cleft (Oberlander, Gingrich, & Ansorage, 2009). This can have adverse effects since many individuals with bipolar disorder naturally possess fewer 5-HTT sites (Shah et al., 2009), making them more sensitive to these medications. This increased sensitivity not only exaggerates the drug's effects but can also trigger manic states and rapid cycling (Mundo, Walker, Cate, et al., 2001). Misdiagnosis is detrimental to both a patient's emotional and physical health. Additional research is necessary to develop treatments or detection methods that reduce patient harm.

The current scope of research mapping out BD and UD is not sufficient to fully understand the similarities and differences between these two disorders (Chang, et al. 2017). Although BD and UD share some behavioural symptoms, the pathways to their common symptoms tell a different story. For instance, for both UD and BD patients, there is an attentional bias towards faces portraying negative emotions (Almeida et al., 2010). Both pathways consist of the orbital medial prefrontal cortex and the amygdala—structures that determine emotional responses to various stimuli. However, BD patients have an increased response to sad faces compared to healthy controls, whereas UD patients have an inhibition of the amygdalar response to happy faces (Almeida et al., 2010). Behavioural symptoms alone cannot always distinguish between the two disorders; a biological marker must be part of the diagnostic process.

Chang and colleagues (2017) found that the level of C-reactive protein in blood plasma can serve as a biomarker to discriminate between BD and UD. C-reactive protein is synthesized by the liv-

er and indicates the presence of inflammation in the body. In BD, the immune system secretes cytokines which contribute to neuroinflammation, signaling to the liver to release the C-reactive protein (CRP). Along with CRP levels, Chang and colleagues (2017) also examined the use of the Hamilton Depression Rating Scale (HDRS), a common assessment of depression, as a method to distinguish between BD and UD patients. They found that when using the HDRS, UD patients could only be distinguished from BD patients prior to receiving any treatment. Conversely, they determined that a baseline level of higher than 621.6 ng/ml in one's plasma was an accurate biomarker for BD both before and after treatment (2017).

The ground breaking research by Chang and colleagues (2017) suggests that levels of CRP are a potential biomarker to distinguish between bipolar disorder and unipolar disorder. A clinically relevant biomarker, such as CRP, could eliminate or decrease the degree to which physicians rely on behavioural symptoms for diagnosis, thus enabling early detection prior to any behavioural changes. The biomarker method is an objective and faster alternative to a physician's opinion in a clinical interview or a poor response to antidepressants. A correct diagnosis will allow BD patients to receive appropriate treatment sooner. Adjunct treatments could focus on CRP-related inflammatory processes that can improve treatment outcomes for BD patients.

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Lifespan Extension

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We all die. But unlike animals, humans develop technologies that extend our lifespan by reducing the lethality of aging symptoms. While existing medical devices and medications can mitigate or reduce some issues brought about by aging, the process of aging itself continues unabated. For instance, medical devices such as the stent act only as a band-aid solution to narrowing arteries and fail to address the gradual stiffening of the arteries from old age (Yin & Chen, 2005). For this reason, various researchers who study biological aging have proposed that we interfere with the process of aging itself to meaningfully extend life; this pins the process of aging as the root problem of age-related diseases (Grey et al., 2002). When aging is approached as a disease, scientific research provides life extending potential.

The process of aging predetermines our life span and is often defined as a natural process that reduces bodily function. This reduction in bodily function could also qualify aging as a disease (Bulterijs, Björk, & Roy, 2015). In both definitions, however, death follows aging because the same biochemical processes that sustain us simultaneously degrade cell functioning. For example, protein synthesis is necessary for cell function, but also causes damage. (Yin & Chen, 2005). With time, sustained damages surpass the protein's ability to renew and cause a cascade of changes within the body. Changes such as artery hardening start as benign but can accumulate into organ failure. In addition to the degradation of cellular proteins, metabolism can also degrade nuclear DNA (nDNA): the genetic material that holds the blueprint of life in almost every cell (Best, 2009). Metabolic processes require chemical reactions, such as hydrolysis, that cause nDNA base pairs to be lost, altered, or bonded with proteins. Like protein damage, nDNA damage results in disease when it accumulates past a certain threshold. As a result, damaged nDNA can cause cancerous tumors and general age-related symptoms, such as wrinkles. For this reason, aging positively correlates to damage accumulation.

Extending life requires a thorough understanding of aging. If we know the mechanisms behind aging, we can learn how to reduce its consequences. As discussed above, biochemical processes lead to age-related damage, so research could focus on altering the biochemical processes themselves. However, past approaches to alter these processes—in particular, metabolic mechanisms—have suggested an uphill battle (Holliday, 2009). We understand little about metabolism and the few successful treatments developed often have significant side effects.

Another approach to aging is the reduction of age-related damages at the cellular level before they reach the threshold for organ dysfunction. One potential solution targets cancerous cell growth by reducing the age-related damages sustained by telomeres (Gonzales-Suarez, Samper, Flores, & Blasco, 2000). Telomeres naturally provide a protective buffer to DNA during cell duplication. When cells duplicate, the telomeres shorten until they can no longer protect the DNA, at which point the cell undergoes apoptosis (death). Moreover, as we age, an increasing proportion of our telomeres shorten. In

mouse trials, the presence of activated telomerase, an enzyme that lengthens telomeres to extend cell life, increased cancerous tumor growth while the inhibition of telomerase led to a reduction in cancerous tumor growth. Researchers propose that the damage caused by age-related telomere malfunctioning may be limited by controlling the activation level of telomerase. While a promising treatment for age-related cancer, telomere shortening only offers a potential cure for a single age-related damage. Unfortunately, aging has multiple triggers.

The intricate nature of aging further complicates the development of life expanding treatment. Aging results from a combination of internal triggers, metabolic processes, and deficient genetic information. From an evolutionary perspective, our health degrades with time because we lack the genetic information to stay healthy as we age (Rose, 2009). Genes that allow human survival past child-bearing years don't offer a direct reproductive benefit. Thus, our bodies inherit less evolutionary mechanisms to survive in old age. To stop aging, scientists would need to artificially insert this missing genetic information. Additionally, the system of internal aging triggers can't simply be turned on or off (Yin & Chen, 2005). The influence of the reproductive tissues on lifespan illustrates the intricacy of aging signals. Various in vivo studies have demonstrated an inverse relationship between the presence of reproductive tissue and lifespan. Here, germ cell removal extends the lifespan of worms and mice by decreasing reproductive abilities, but ovary implantation extends the lifespan of mice by increasing reproductive abilities (Flatt et al, 2008; Hsin & Kenyon, 1999; Mason, Cargill, Anderson, & Carey, 2009). These contradictory findings suggest a delicate relationship between reproductive tissues and life extension.

Treatment relating to the reduction of age-related damages proves equally as complex (Rudolph, Millar, Bosenberg, & DePinho, 2001). For instance, while complete telomerase inhibition stops cancerous tumors, moderate reduction increases tumor growth. If the treatment fails to fully inhibit the telomerase, cancerous growth will accelerate. For this reason, a cure for aging must balance the myriad of factors involved. It must address all accumulated damages that result from aging, stop aging triggers, and maintain balance within the body. A cure for aging is complicated but perhaps not impossible given future technological advances.

Life extension requires extensive research. Biochemical processes cause damage accumulation in countless forms. Telomere activation and degraded nDNA, as mentioned above, exemplify better understood damages, but few studies currently explore damages from other sources such as mutated mitochondria (Yin & Chen, 2005). Regardless of whether treatment succeeds in keeping age-related damages below threshold, internal triggers alone could sufficiently initiate aging (Yin & Chen, 2005). While a total cure for aging may remain in the domain of science fiction, life extension research forces scientists to rethink how we approach age-related death. By breaking the relation between aging and mortality into its components—biochemical processes, damage accumulation, and pathology—life extension research demystifies aging, making it accessible for further research.

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Political Extremism and the Illusion of Explanatory Depth

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When it comes to politics, extremists on the far left and far right have something in common: neither group understands what they are talking about. Politics involve the use of complex systems like education and healthcare, yet people with extreme political beliefs feel confident that they can offer simple solutions. The illusion of explanatory depth (IOED) is when people incorrectly assume they have a nuanced understanding of a concept, and feel confident in their understanding, despite their flawed logic. The IOED makes us overestimate our understanding of complex information (Rozenbilt & Keil, 2002). Due to the illusion, we rarely see the flaws in our arguments, allowing extreme ideas to grow unchecked. The illusion of explanatory depth intensifies extreme political opinions.

A misunderstanding of politics stems from the IOED (Lammers, Koch, Conway & Brandt, 2016). IOED describes an overconfidence in explanatory knowledge, rather than overconfidence in knowledge in general (Rozenblit & Keil, 2002). Explanatory knowledge includes any understanding of mechanisms, from the workings of a toaster to immigration policy. Political explanatory knowledge refers to "the art or science concerned with guiding or influencing government policy" (Politics, n.d.). Political explanatory knowledge is complex, yet easily accessible through news and social media. Open access to knowledge makes us feel knowledgeable (Rozenblit & Keil, 2002). We often think that seeing information equates to understanding it. However, reading freely available news about policies does not translate into understanding of the complex mechanisms behind the ideas. We fall victim to the IOED because of how easily we can access — and oversimplify— political information.

The IOED oversimplifies complex concepts and simplicity helps us take ideas to the extreme (Lammers et al., 2016). Extreme politics benefit from oversimplification because the less factors we consider when forming an opinion, the smaller the chance of finding contradictory information (Linville, 1982). Consider Linville (1982)'s cookie experiment, which investigates how simplicity affects opinions. When people evaluate two qualities of a cookie, such as sweetness and texture, they come to more extreme conclusions relative to people who evaluate six cookie qualities. Considering several qualities or factors leads to nuance and perspective, in politics and pastries alike. In politics, people with extreme beliefs simplify aspects of government, such as the platforms of well-known politicians (Lammers et al., 2016). When asked to place politicians along a political spectrum, people with neutral opinions categorize politicians without clustering or polarization. Extremists categorize politicians into one of two groups, at either end of the spectrum. Extreme politics and simplicity go hand-in-hand. By oversimplifying extreme politics, people reach inaccurate conclusions. However, this does not stop people from feeling confident about their conclusions.

The IOED makes people overconfident about extreme ideas (Fernback, Rogers, Fox, & Sloman, 2013). Confidence becomes overconfidence when the feeling of certainty stops indicating the level of knowledge (Lammers et al., 2016). People with extreme political beliefs feel more confident in their politics than people with moderate beliefs, whether or not they have more accurate knowledge. When people with extreme politics estimate how each state voted in the 2012 United States presidential election, they make less accurate estimates than people with neutral politics (Lammers et al., 2016). Extremists simplify the voting results of each state, estimating that most voters favour one candidate over the other. Politically neutral people accurately estimate the political divisions within a state. Not only do people with extreme beliefs make less accurate estimates, their inaccuracies result from oversimplification. They simplify the voting results into left or right-leaning states. Even when people on the left and right ends of the political spectrum have similar knowledge of political situations, extremists show higher certainty; they believe they have superior, more objective opinions and simple solutions (Prooijen et al., 2018).

The combination of overconfidence and oversimplification defines the IOED perfectly. The illusion allows extremists to hold beliefs that would fall apart with deeper questioning—questioning that exposes the gaps in logic.

Awareness of the IOED softens extreme political opinions (Mills & Keil, 2003). Once people recognize gaps in their logic, they feel less certain. As a result, their beliefs become more moderate (Fernback et al., 2013). Exposing gaps in logic requires asking the right questions. Asking someone to list the reasons they believe in extreme policy only strengthens the illusion of explanatory depth, because hearing our own ideas reinforces our confidence in them. To break the illusion, ask people to explain the mechanisms behind their beliefs. Once extremists struggle to explain every step in a political plan, they realize the underdeveloped, simplistic nature of their original ideas. This realization produces a tangible difference: extremists are less likely to donate to extreme political advocacy groups after breaking the illusion. Breaking the illusion takes little effort, making IOED one of the few problems with a genuinely simple solution.

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Social Media Use and Depresssion: You Have One New Notification (!)

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You have twenty notifications from Instagram, fifteen from Facebook, ten from Snapchat, eight from Twitter, and five from YouTube—all coming to you at once. As a young adult, you check them instantly. Given the proliferation of social media in your generation, you are not alone in impulsively grabbing your phone. Up to 90% of young adults engage in social media use (Primack et al., 2017). While you post a flattering selfie, 'like' an informative status, or watch a trending video, social media shapes your personality and behaviour. By browsing the posts of others or sharing your own, you spend up to three hours on social media every day (Salim, 2019). Young adults thrive on social media.

Social media induces greater social comparisons. Humans possess a fundamental drive to compare themselves with others (Vogel, Rose, Roberts, & Eckles, 2014). Social media platforms—such as Instagram, Facebook, Twitter, Snapchat, and YouTube—provide ample social comparison opportunities. These platforms expose us to others' personal information we may not encounter otherwise. We compare our 'offline' selves to the 'online' personas portrayed on social media. But interacting through 'friends' and 'followers' on social media allows us to see only what users want us to. Profiles of highly attractive and successful individuals often induce negative, rather than positive, social comparisons (Lup, Trub, & Rosenthal, 2015). Social networking sites allow for carefully planned self-presentation unafforded by face-to-face interactions (Vogel et al., 2014). Users selectively post content, such as pictures, videos, and statuses, that represent only their ideal selves. Exposure to strategically constructed online profiles triggers poor self-evaluation (Vogel et al., 2014). When we compare ourselves to the meticulous online appearance of others, only negative consequences await our psychological well-being (Vogel et al., 2014).

Social comparisons drive depression (Vogel et al., 2014). Negative social comparisons mediate the relation between social media and depression (Lup et al., 2015). As most individuals present only desirable traits, users are highly susceptible to the distorted belief that others have better lives than them. Misrepresentative content on social media perplexes us; we wonder why we receive fewer 'likes' or comments, project less attractiveness, and live worse lives than others. Such envious thoughts lead to feelings of inadequacy, low self-esteem, negative affect, and can cause rumination—repeatedly going over a thought—which can induce depression (Feinstein et al., 2013). Following many strangers on social media platforms provides a wider range of content for social comparison. Making negative social comparisons to multiple strangers increases the risk of depression because without knowing them 'offline', their profiles appear genuine (Lup et al., 2015). An example can be seen in 'Facebook envy': users perceive their 'social attractiveness' as less than other users, resulting in feelings of inferiority (Tandoc Jr., Ferrucci, & Duffy, 2015). Attribution theory suggests social comparisons drive

depression because we ascribe others' behaviours to personal rather than situational influences. (Lup et al., 2015). Personal attribution convinces us that enhanced posts represent people's real lives. Falsely believing misleading posts induces rumination, leading to depression (Feinstein et al., 2013). The increase in social media use and prevalence of depression in young adults has led to a term coined "Social media induced depression" (Lin et al., 2016).

Young adults are prone to social media induced depression (Primack et al., 2009). Social media has become a dominant aspect of society in the past decade, a formative time for the current generation of young adults (Lup et al., 2015). Platforms such as Instagram, Facebook, Twitter, Snapchat, and YouTube, are booming. Social media use has risen by approximately 78% since 2005 (Whaite, Shensa, Sidani, Colditz, & Primack., 2018). Given that depression often begins around young adulthood, young adults are at a larger risk for social media induced depression (Primack et al., 2009). Social media influences young adults during a time crucial for identity development and social establishment (Lup et al., 2015). Young adults often do not realize the harmful psychological effects of social media because they tend to describe their experiences in positive terms (Shafer, 2018). Misrepresentative posts have become increasingly acceptable, where enhancing photos through filters and photoshop is a social norm (Lup et al., 2015). Filtered content blurs the line between appearance and reality, which often goes unnoticed. Young adults tend to interpret social media content as representative of reality (Tandoc Jr. et al., 2015). A skewed perception in addition to the pressures of young adulthood creates the ultimate risk for social media induced depression.

Exposing social media induced depression helps young adults (Lup et al., 2015). Young adults mindlessly consume social media without considering the elevated risk for depression. The relation between social media and depression must be exposed to assess harmful usage and implement preventative measures (Lin et al., 2016). We must use the current platform for expression, social media itself, to create awareness of its pernicious effect on psychological well-being. So, go ahead and check those notifications, but be cognizant of their psychological consequences.

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The Effect of Kangaroo Mother Care on Maternal Mental Health

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Introduction

Postpartum depression (PPD) is a psychiatric disorder which affects around 7.5% of Canadian women (Pregnancy and Women's Mental Health in Canada, 2014). According to the Diagnostic and Statistical Manual of Mental Disorders (DSM), a diagnosis of postpartum depression requires patients to meet the criteria for a major depressive episode as well as the criteria for the peripartum-onset specifier. The peripartum specifier refers to the onset of depression during pregnancy or within 4 weeks of delivery (Segre & Davis, 2013). Due to prevalence and consequences of PPD, early intervention is very important to both the mother and infant. A relatively novel intervention method used in neonatal care for preterm babies is skin-to-skin contact (SSC) also known as Kangaroo Mother Care (KMC). Following a 70% death rate of premature infants in Colombia, SSC was introduced in 1978 as an alternative to low-birth weight infant care (Chiu & Anderson, 2009). It was found that holding the infants close to their mother's chest reduced the mortality rate leading to improvement in temperature regulation, development of attachment, breastfeeding, and protection from infection, among other physiological and mental health outcomes (Kangaroo Mother Care: A Practical Guide, 2003). This paper addresses the state of extant literature related to the following questions: (1) To what extent does Kangaroo Mother Care impact maternal mental health, specifically anxiety and postpartum depression, and (2) What role does oxytocin play in the relationship between Kangaroo Mother Care and its impact on mental health?

KMC is the name of the general intervention used primarily for low birth weight (LBW) infants, while skin-to-skin contact is one component of KMC (Bergman, Linley & Fawcus, 2004). During KMC, the infant typically wears just a diaper and is held in an upright prone position using a support binder, against the bare chest of the parent (Kangaroo Mother Care: A Practical Guide, 2003). Once in position, the infant is covered with clothing or a blanket. The recommended duration of a KMC session is at least 1-2 hours and sessions are repeated daily (Bigelow, Power, MacLellan-Peters, Alex & McDonald., 2012). Research suggests that KMC can be practiced as soon as an infant is in a stable medical condition and repeated for as long as possible until the infant starts to show signs of discomfort, suggesting that is it time to cease KMC (Kangaroo Mother Care: A Practical Guide, 2003).

Literature Search

The consensus on KMC and SSC is that there are positive effects for both parents and infants, particularly regarding postpartum depression. The primary measure of postpartum depression is the Edinburg Postnatal Depression Scale (EPDS) which is a 10-item survey. Examples of survey prompts are "I have felt sad or miserable" and "The thought of harming myself has occurred to

me" (Royal College of Psychiatrists, 1987). These prompts are answered based on how closely the mother agrees with the statement. Many studies investigate the impact of skin-to-skin contact on preterm infants because of the significant amount of time they spend separated from their mother shortly after birth. The research on full-term and preterm infants generally yields the same positive results. A study by Brooten et al. (1988), found that mothers of high-risk preterms were significantly more anxious and depressed before their infant was discharged from the hospital than when the infant was 9 months old. This study outlines the importance of assessing the current interventions used for preterm infant care and the vulnerable situation mothers are in following childbirth.

This paper will begin by examining studies that focus on the effect of KMC on maternal mental health. In a study by Badiee, Faramarzi & MiriZadeh (2014), the effect of Kangaroo Mother Care on the mental health of mothers with low birth weight infants was investigated. They found that mothers with preterm babies suffer from greater anxiety and depression compared to mothers of full-term babies, which puts them at greater risk for postpartum depression. A predominant contributor in anxiety and depression stems from the process of preterm babies being separated from their mothers for significant periods of time, reducing the bonding ability between mother and infant (Medina et al., 2018). The experimental group consisted of mothers performing three sessions of 60-minute KMC daily for a week, while the control group received standard incubator care. The results pointed to the finding that KMC improved any pre-existing symptoms of anxiety, disordered sleep habits, and depression, as well as increased levels of social interactions. The KMC technique was more effective in reducing maternal anxiety and stress. The authors concluded that KMC is a suitable method for reducing maternal stress during the postpartum period.

Additionally, a prospective study by de Alencar, Arraes, de Albuquerque & Alves (2009), looked at the direct relation between kangaroo

mother care and postpartum depression in low income mothers with sick preterm infants. Low-income mothers are twice as likely to develop postpartum depression, making this an interesting risk factor for the investigators to research (Alencar, Arraes, de Albuquerque & Alves, 2009). The mothers were given a kangaroo bag which they were asked to use for a minimum of 1-2 hours a day. Kangaroo bags are typically made of a soft flannel material and it allows the mother to carry the infant close to her chest and engage in skin-to-skin contact while having her hands free (World Health Organization, 2003). They admitted 66 mothers with postpartum depression and found that the number of depressed mothers in this group went down to 30 by the time of discharge following the use of the kangaroo bag. Mothers who practiced KMC reported feeling more energetic, coordinated, happy, friendly, and clear-headed. One limitation of this study was that no control group was followed suggesting that a comparison between standard care outcomes and KMC outcomes cannot be made. Based on the results, the investigators concluded that Kangaroo Mother Care may be effective in reducing maternal depression. The next study also evaluates the effectiveness of KMC on PPD but examines depression longitudinally.

A study by Herizchi, Hosseini & Ghoreishizadeh (2017) investigated the impact of kangaroo mother care on postpartum depression in mothers of premature infants. The experimental group consisted of mothers who practiced KMC for one hour a day on at least 3 occasions. The control group practiced KMC for less than 3 sessions or less than an hour a day. They used the EPDS implemented at 3 timepoints: day 10, day 20, and day 30. Referring to Figure 1 below, the difference in depression frequency between KMC and control groups on day 10 was insignificant but the difference was consequential on days 20 and 30 (Herizchi, Hosseini & Ghoreishizadeh, 2017). Another pattern seen in the graph is that the control group showed an increase in their EPDS score, suggesting greater depression over time, while the KMC group showed a decreasing trend in their EPDS score, suggesting less depression over time.

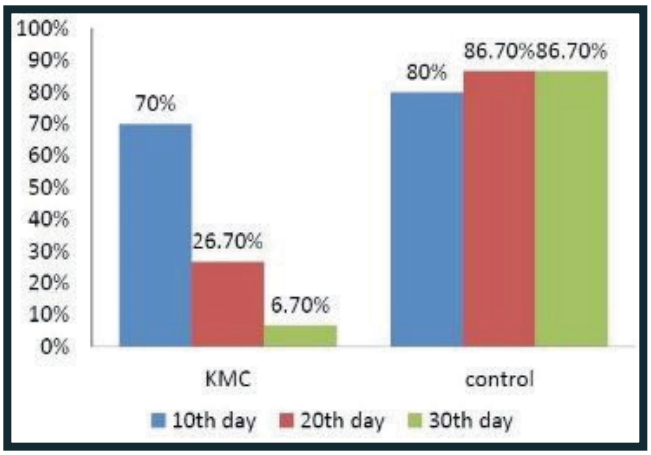

Figure 1: Depression frequency, on the y-axis, in mothers of 2 groups; Kangaroo Mother Care and control stratified by three time intervals: 10th day, 20th day and 30th day. Adapted from Herizchi, S., Hosseini, M. B., & Ghoreishizadeh, M. (2017). The impact of Kangaroo-Mother care on postpartum depression in mothers of premature infants. *International Journal of Women's Health and Reproduction Sciences*, 5(4), 312–317.

The following 2 studies concentrate on maternal mood in general, which includes feelings of positivity, mood variation, coordination and calmness. The first meta analysis looked at maternal mood and how it is impacted by KMC. Athanasopoulou & Fox (2014), investigated 9 studies that looked at the effects of KMC on the mood of mothers with preterm infants. In 5 out of 9 studies, there were significant differences between the mood of mothers in the KMC group and those in the control group. Specifically, KMC was found to improve negative maternal mood and promote more positive parent-child interactions (Athanasopoulou & Fox, 2014).

The second study by de Macedo, Cruvinel, Lukasova & D'Antino (2007) examined mood variation in mothers of preterm infants. Three groups were studied: (1) mothers of term newborns (TG), (2) mothers of preterm infants undergoing KMC (PGK), and (3) preterm infants in incubators (PGI). They found that TG mothers reported fewer depressive episodes on the Visual Analogue Mood

Scale than both the PGK and PGI mothers. Additionally, PGK mothers reported feeling calmer, stronger, more well-coordinated, and happier compared to the PGI mothers. The authors concluded that KMC had positive effects on maternal mood variation. In order to better understand why SSC has been successful as an intervention method for PPD, it is important to investigate its mechanism in the body.

Mechanism

The exact biological underpinnings as to why SSC has produced positive effects in parental mental health is not clear, but some studies suggest that it may have to do with the role of oxytocin in the nervous system. The first study considers the relationship between oxytocin levels and anxiety, the second study investigates oxytocin's antidepressant properties and the final study considers a broader perspective introducing other hormones. Oxytocin has a reputation of being a love hormone because of its role in preparing mothers for motherhood, fostering attachment between partners and impacting sex drive (Oxytocin, 2015). Oxytocin's most significant actions in the body are inducing contractions during childbirth and producing milk in breastfeeding mothers through a positive feedback loop (Prevost et al., 2014). The relationship between oxytocin, SSC, and breastfeeding is vital to understanding the underlying mechanism behind reduced anxiety and depression in mothers.

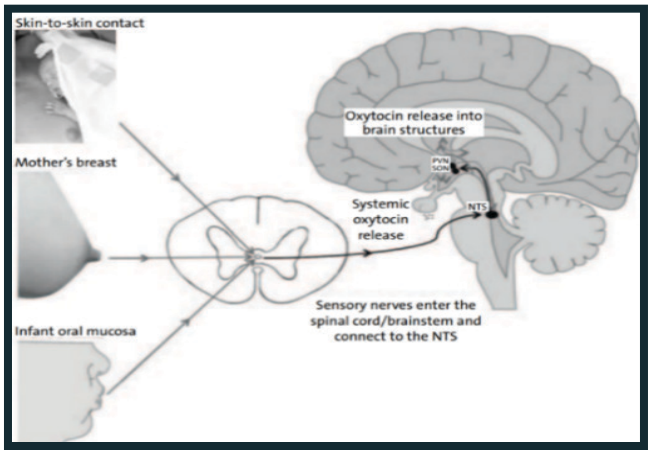

Figure 2: Different kinds of sensory nerves located in the skin, the mother's breast and the infant's mouth can release oxytocin during mother-infant interactions by relaying to the nucleus tractussolitarias (NTS), the paraventricular nucleus (PVN) and the supraoptic nucleus (SON). Adapted from Moberg, K. U., & Prime, D. K. (2013). Oxytocin – a system activator. Infant, 9(6), 201–206. Retrieved from http://www.infantgrapevine.co.uk/pdf/inf_054_ers.pdf

Revisiting the study by Cong et al. (2015), these authors also investigated changes in salivary oxytocin levels in mothers and fathers at 3 time points; pre-, during and post-SSC. The results demonstrated that maternal oxytocin levels increased from baseline during-SSC and then dropped post-SSC. On the other hand, paternal oxytocin levels increased from baseline during-SSC and then stayed high post-SSC. They also found that fathers with previous SSC experience had higher oxytocin levels than those with no previous experience. The authors suggest that infants in contact with either parent through SSC led to increased oxytocin levels and may have even contributed to preparation for breastfeeding in mothers. Cong et al. (2015) suggest that the mechanism of stress reduction may involve oxytocin modulating the autonomic nervous system, responsible for fight or flight responses, resulting in less anxiety experienced by the parents. The next study focuses on the role of oxytocin in depression.

A study by Kim et al. (2014) examined the general relationship between oxytocin and postpartum depression suggesting that oxytocin may have antidepressant properties. In various animal models it was found that rats who were administered oxytocin had lower scores on depression measures and reduced anhedonia, sleep dysfunction and sexual dysfunction. There are no conclusive reports regarding human studies of oxytocin and its potential as an antidepressant yet, but the authors suggest that it does have potential to be used as a treatment option. However, there are many other variables to take into consideration such as gender, individ-

ual differences in PPD and side effects of oxytocin administration (Kim et al., 2014). The final study focuses on the role of oxytocin as an anti-anxiety hormone along with other key hormones related to stress.

A third study by Handlin et al. (2009) looked at the relation between SSC, cortisol and adrenocorticotropic hormone (ACTH). Cortisol has an active role in stress responses and its secretion is controlled by the hypothalamus-pituitary-adrenal (HPA) axis (Cortisol, 2019). Cortisol levels are high during times of stress and they are dampened when one is relaxed or comfortable (Cortisol, 2019). The second hormone, ACTH, regulates cortisol levels in the body, so when cortisol levels are high, ACTH levels are also high (You and Your Hormones, 2019). The relationship between oxytocin and these hormones is less well understood, so in this study ACTH, oxytocin and cortisol was investigated in the context of breastfeeding. As expected, the authors found a positive relationship between ACTH and cortisol levels. Additionally, they found a significant negative relationship between oxytocin and ACTH levels, and a negative relation between the duration of SSC and cortisol levels. They concluded that SSC is a significant contributor to the effect of breastfeeding on reducing cortisol levels.

Overall, much of the research on oxytocin is yet to be comprehensively established in human models, but there is potential for oxytocin to explain the mechanism of SSC reducing maternal stress and depression.

Conclusion

Postpartum depression is an important mood disorder to explore because of its comorbidity with other mental disorders such as obsessive-compulsive disorder, anxiety, suicidal ideation and self-harm (Pope & Mazmanian, 2016). Suffering with PPD puts mothers at a much higher risk of developing these mental disorders, making early intervention vital. Kangaroo Maternal Care (KMC) is an effective intervention technique for reducing maternal depression and anxiety and improving their mental health. Although the exact physiological mechanism for the effectiveness of skin-to-skin contact is unknown, this is an active area of research today, with the role of oxytocin showing some promise.

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Atypical Child, Atypical Family

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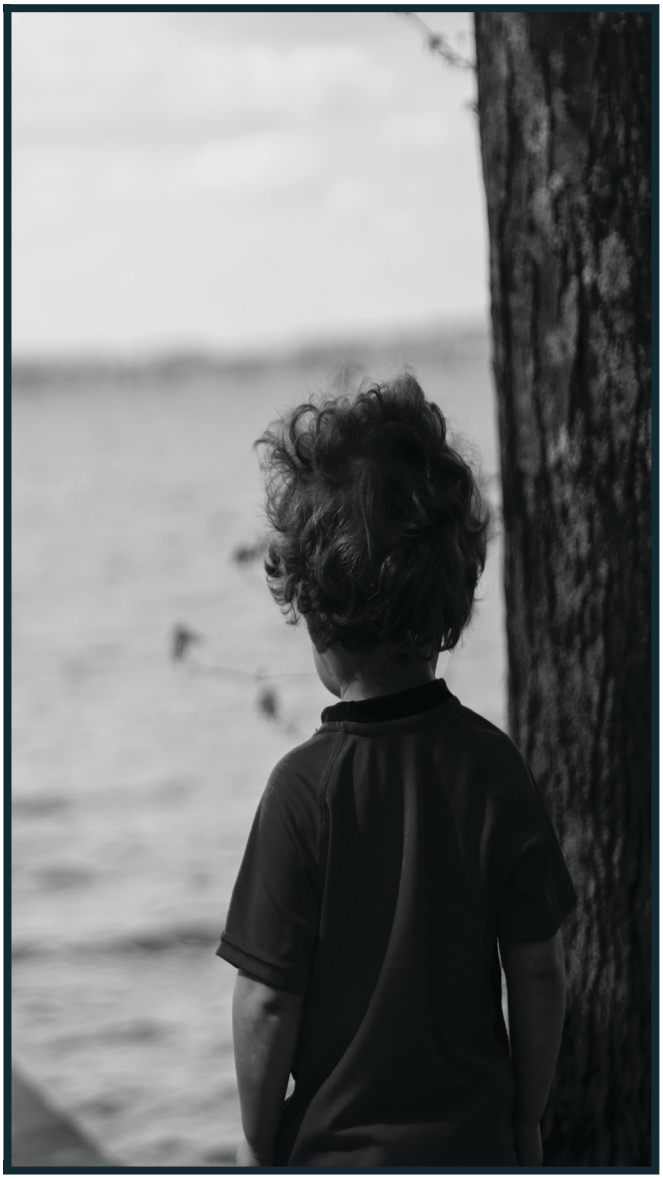
Imagine holding your newborn baby for the very first time. All you hope is that your child has a challenge-free life, and you begin to form expectations of your family life together. However, at an early age your child is diagnosed with Autism Spectrum Disorder (ASD), and suddenly your world changes. Children with ASD have unique needs, that can lead your family to function in a way you never expected. Some individuals with ASD exhibit poor executive function and communication skills. They may struggle to complete daily tasks like eating and brushing their teeth, and their need for specific routines can prevent them from coping with unpredictable changes. Overstimulation and difficulty communicating their needs commonly trigger challenging behaviours in some children with ASD. These behaviours include emotional outbursts, restricted and repetitive movements, aggression, or self-injury. Social interactions are challenging for many individuals with ASD because they may have difficulty understanding non-verbal communication, such as gestures, body language, and tone of voice, as well as the emotional states of others. Their verbal skills can also be limited, ranging from awkward and inappropriate to a complete lack of speech, further reducing their ability to communicate with others (Research Autism, 2016; Bennie, 2018; National Institute of Neurological Disorders and Stroke, 2018). Although ASD exists as a spectrum, with diagnosed individuals varying in symptoms and severity, every individual with ASD experiences unique challenges that require accommodation. Raising a child with ASD introduces obstacles to the household and requires sacrifices from family members, decreasing quality of life for the rest of the family.

Children with ASD require more time and money than typically developing children. While ASD is a lifelong disorder, behavioural treatment can improve skills and reduce challenging behaviours (National Institute of Mental Health, 2018). To improve their child's symptoms, parents of children with ASD must rely on expensive and time-consuming therapies. Applied Behavioural Analysis (ABA)—the most frequently recommended and used behavioural treatment for children with ASD—requires 30-40 hours per week of intensive one-on-one therapy and can cost up to $30,000 a year (Sharpe & Lee Baker, 2007). ABA therapy does not stop at sessions with the therapist. To ensure the effectiveness of treatment, parents must consistently apply the principles of the ABA approach in the child's daily life (Behavioural Health Centre of Excellence, 2019). Aside from treatment, daily care for a child with ASD requires dedication and time. Families must organize their days based on maintaining routines and catering the environment to the needs of the child with ASD, as well as managing challenging behaviours. As a result, time is taken away from other responsibilities parents and family members have. Mothers of children with ASD work an average of 7 hours less per week and are 6% less likely to be employed than mothers of typically developing children. Due to reduced working hours, families of children with ASD earn an average of 28% less than typical families, which increases the financial burden ASD treatment

creates (Cidav, Marcus, & Mandel, 2012). The accommodations necessary to raise a child with ASD also take attention away from other children in the household who don't have the same high care needs. Siblings of children with ASD may be jealous of the amount of time parents spend with the disordered sibling, and frustrated by the lack of quality time reserved for them (Autism Society, 2016). Caring for a child with ASD leads to an unequal distribution of resources and creates an atypical home environment, which hurts the family dynamic.

ASD in a household strains relationships between family members. Many children struggle to bond with a sibling who has ASD due to the communication and social challenges associated with the disorder. Siblings of children with ASD report less intimacy and prosocial behaviours, such as sharing, cooperation, and acts of kindness, in their sibling relationship compared to typically developing sibling pairs (Autism Society, 2016; Kaminsky & Dewey, 2001). Sibling relationships can also be strained when the child with ASD experiences a trigger for a challenging behaviour while interacting with their typically developing sibling. 84% of children reported incidents of their sibling with ASD showing aggressive behaviour in sibling interactions, leading to feelings of anger in the typically developing child (Ross & Cuskelly, 2006). In addition to sibling relationships, parent relationships face unique obstacles when raising a child with ASD. Keeping up with therapy and the high care demands of a child with ASD requires dedication and time. Consequently, less time is available for parents to communicate their frustrations, share intimate moments, or maintain a healthy relationship. Parents of children with ASD report low marital happiness and have higher rates of divorce than parents of typically developing children (Hartley et al., 2010; Higgins, Bailey, & Pearce, 2005). Families affected by a child with ASD prioritize the disordered child above all others in the household, and as a result, other family members fail to properly address their needs.

Families affected by ASD experience increased psychological distress. Growing up, the siblings of children with ASD become accustomed to an atypical household environment, possibly leading to the development of maladaptive behaviours. The typically developing siblings have a higher risk of developing 'internalizing behaviour problems', which refer to negative psychological states, such as anxiety and depression (Ross & Cuskelly, 2006). For parents, it can be taxing to take care of a child who is unable to function independently and struggles with basic activities. Parents of children with ASD report significantly higher levels of parenting-related stress than parents of typically developing children (Davis & Carter, 2008; Padden & James, 2017). The increased stress involved in raising a child with ASD contributes to an increased lifetime prevalence rate of anxiety disorders and major depressive disorder among parents of children with ASD (Padden & James, 2017; Piven et al., 1991; Bitsika & Sharpley, 2004). The challenges that parents and siblings face as a result of accommodating a child with ASD can be harmful to their mental health. Fortunately, workshops where parents of



children with ASD learn stress-management strategies have been shown to positively affect parents' well-being. Support groups also give the opportunity for parents to share their experiences with one another while providing a community to learn and gain validation from (Catalano, Holloway, & Mpofu, 2018). To mitigate the risk of poor psychological outcomes, families affected by ASD require increased attention and support for their challenges.

Greater support for ASD-affected families will improve quality of life. ASD intervention tends to revolve around the needs and health of the diagnosed individual. However, all family members are affected, and as such, ASD treatment requires a holistic approach. Popularizing the inclusion of individual, couple, and family counseling as part of ASD treatment and increasing supportive resources for both siblings and parents would help families reduce potential well-being risks while living in an atypical home environment. Additionally, implementing methods to decrease the financial burden ASD treatment creates can assist in balancing the family's distribution of resources and alleviate financial stress from parents. Think back to your baby – no matter what the future holds you will continue to love and support your child in whatever way they need. However, the support and care of one child should not have to result in severe limitations for the rest of the family.

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Why Teenagers Make Terrible Decisions

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The age-old question: stay in to do homework, or go to a party? For teenagers, the answer seems obvious. A party provides immediate gratification, while homework does not. To the rest of the world, it might seem baffling to ignore homework, given that it is the better choice in the long-term. To understand this lapse in judgement, it is necessary to look beyond the social factors and examine the biological underpinnings of behaviour. Teenagers are biologically predisposed to making risky decisions due to their developing brains. As teenage brains mature, neurological changes occur which alter overall brain function, including their decision-making process. Teenagers struggle to consider the future consequences of their actions and choose to make decisions that offer immediate benefits instead. As a result, teenagers make risky decisions.

The limbic system motivates decision making. Located in the centre of the brain, the limbic system is often referred to as a human's 'reptile brain'. It supports neural functions such as emotion, behaviour, and memory formation. One of its main purposes is to provide a neural mechanism by which motivation gets translated into action (Robbins & Everitt, 1996). When faced with a situation that requires a decision, the limbic system sends out impulses to act. One of the most famous examples of this is initiating a 'fight or flight' response. (Hariri, Bookheimer & Mazziotta, 2000). This scenario requires a rapid assessment and decision of a potentially dangerous situation—avoid the danger (flight) or stay and deal with it (fight). Without the limbic system motivating a quick decision, humans would be much more vulnerable to dangerous situations. In order to effectively make decisions, teenagers need an optimally functioning limbic system.

Teenagers' limbic system develops prior to their frontal lobe. As teenagers enter puberty, their brain undergoes a complete rewiring in order to strengthen neural connections and increase processing speed. This brain development occurs in a back to front manner (Arain et al., 2013). Residing in the back of the brain, the limbic system is one of the first brain regions to complete the process. First, an increase in axon myelination occurs, which increases the speed at which brain signals are sent. Second, the connections in the brain which are not useful get pruned away (Choudhury, Charman, & Blakemore, 2008). This cascade of brain development occurs throughout adolescent puberty, and the last region to get re-wired is the frontal cortex. As the frontal cortex resides in the very front of the brain, it does not fully mature until the later stages of adulthood (Gogtay et al., 2004). Due to this disparity in development, the majority of teenage brain regions involved in decision making —save the limbic system—are thought to be structurally inadequate (Romer, 2009). This imbalance of development within the various brain regions leads to compromised decision-making.

Differential brain development promotes risky decisions. In contrast to the limbic system's

present-based mindset, a fully developed frontal cortex promotes goal-directed behaviour; including planning, response inhibition, and improved attention (Johnson, Blum & Giedd, 2009). Unfortunately, the frontal cortex does not yet have the ability to function at optimal levels during teenage years, leaving the limbic system without its future-focused counterpart in the decision-making process. As the limbic system cannot analyze future consequences (Bechara, Damasio, Damasio & Anderson, 1994), the maturational gap in development of the limbic system and frontal cortex results in an inevitable period of risky behaviour (Romer, 2009). By favouring decisions that result in immediate rewards, teenagers are more susceptible to engaging in risk-taking behaviour. An activity like underage drinking—which provides immediate pleasure—is highly popular among teenagers, with 62% of Canadian teens (13–17 years-old) consuming alcohol in 2007(Huckle et al., 2008). While under the influence of alcohol, teenagers have a higher risk of injuring themselves, as 30% of teenagers injured in car crashes are intoxicated at the time of the incident (Williams, 2003). This propensity for engaging in risky behaviour begins to decrease as the teenage brain finishes developing.

Compared to teenagers, adults make fewer risky decisions. As teenagers transition into adulthood, their developing brains near full maturation. Axonal myelination finishes in the frontal cortex, and all unnecessary synapses have been destroyed. Finishing development around the age of 25 years old (Gogtay et al., 2004), the newly re-wired brains have improved balance between the limbic system and frontal cortex. Young adults are less prone to make risky decisions then they did while they were teenagers, as any decisions now include the future-focused frontal cortex.

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The Adverse Relationship Between Chronic Stress and Anxiety Disorders

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We all know the feeling of stress- fast heart rate, sweaty palms, and tunnel vision. Of course, it is beneficial to occasionally experience stress; it helps us meet that tight deadline, slam the car breaks, or concentrate during an exam. However, experiencing ongoing stress for months or years-referred to as chronic stress-is harmful since it induces neuroplastic changes that impact the brain's structure and physiology. Specifically, chronic stress enhances the activity of the amygdala while degenerating the prefrontal cortex and hippocampus (Mah, Szabuniewicz & Fiocco, 2016). The knowledge that chronic stress induces brain damage is not new, but recent research demonstrates that chronic stress is also a common risk factor for the development of anxiety disorders (Pryce & Fuchs, 2017).

In order to better understand how chronic stress may lead to the development of an anxiety disorder, it is essential to understand what anxiety is and how it impacts the brain. Anxiety is a mental health disorder characterized by the dysregulation of signals firing in the neurocircuitry of fear. The neurocircuitry of fear has three key components: the amygdala, the hippocampus, and the prefrontal cortex. The role of the amygdala is to detect threats and generate emotional responses, such as fear. Contrastingly, the hippocampus and prefrontal cortex downregulate the emotional responses from the amygdala when they are inappropriate. The hippocampus does so by encoding and relaying contextual information relevant to the threat stimulus. For instance, if you saw someone holding a knife you might initially be frightened. However, the hippocampus will encode that the person holding the knife is your dear mother, and she is holding a knife so that she can cook you dinner. The prefrontal cortex assists the hippocampus in downregulating inappropriate emotional responses by consciously suppressing negative emotions to distract from the threat, as well as reconsidering the threatening stimulus. For instance, the prefrontal cortex would help you suppress your emotional response towards the knife and consciously reconsider whether it poses a threat to you. A person's emotional regulation is considered normal when the activity of the amygdala is in balance with the activity of the hippocampus and prefrontal cortex. In the case of anxiety disorders, the neurocircuitry of fear is dysregulated such that the amygdala's emotional response to threat is exaggerated, while the hippocampus and prefrontal cortex's ability to mitigate the emotional response is impaired (Mah et al., 2016).

It is difficult to establish whether accelerated heart rate, sweaty palms and butterflies are symptoms of anxiety or stress. This is because anxiety and stress are associated by virtue of their common neurocircuitry. Moreover, chronic stress can alter the neurocircuitry of fear such that it closely resembles that of anxiety disorders. It does so by inducing changes in brain physiology and structure, which results in increased activity of the amygdala along with degeneration of the hippocampus and prefrontal cortex (Mah et al., 2016). Chronic stress leads to increased activity in the amygdala by induc-

ing dendritic growth (Mah et al., 2016) and by reducing regulatory influences during action potential firing (Rosenkranz, Venheim & Padival 2010). This hyperactivity allows the amygdala to exert a more powerful influence over the prefrontal cortex and hippocampus and elicit a stronger emotional response. Additionally, chronic stress induces structural damage to the prefrontal cortex and hippocampus, hindering their ability to downregulate emotional responses. The hippocampus is damaged by stress-induced hormonal changes which lead to atrophy and decreased neurogenesis (Vyas, Pillai & Chattarji, 2004). This compromises one's ability to inhibit the stress response once a threat has passed, leading to further damage (Mah et al., 2016). In other words, the more one's stress response is activated, the harder it is to reduce the response and return to a balanced state. Similarly, damage occurs in the prefrontal cortex. Animal models show that the pyramidal neurons experience dendritic loss and reduced functional connectivity after chronic stress exposure (Radley et al., 2011). Therefore, chronic stress leads to a decreased ability to downregulate the emotional response of the amygdala, which is a pattern also seen in individuals with anxiety disorders (Mah et al., 2016).

Furthermore, stress-induced changes in brain physiology or structure can contribute to the causation and development of anxiety disorders. Amygdalar hyperactivity is consistently demonstrated in patients with anxiety disorders (Etkin, & Wager 2007), but chronic stress can worsen already present symptoms by further increasing amygdalar excitability (Rosenkranz et al., 2010). Chronic stress also leads to the degeneration of the hippocampus. As a result, the hippocampus' ability to learn, regulate emotions and inhibit stress is hindered, which exacerbates symptoms of anxiety. The prefrontal cortex plays a role in modulating stress and emotional responses (Raineki et al., 2014). Stress-induced changes that occur in the prefrontal cortex, such as abnormal volume and deficient activity,

are observed in individuals with anxiety disorders. Chronic stress and anxiety are associated by virtue of their co-occurrence, neurocircuitry and the similarity of their abnormal brain activity patterns (Mah et al., 2016).

Chronic stress alters human physiology and brain structure, posing a major risk factor for anxiety disorders. However, despite the consequences, the prevalence of chronic stress today remains unaddressed. Chronic stress can go undetected for long periods of time since it manifests itself as different mental health conditions, including anxiety disorders. Insight into chronic stress' relationship with other mental health concerns may allow for the development of new prevention methods and treatment strategies. Future studies may allow us to answer the critical question: is chronic stress at the center of society's modern anxiety epidemic?

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Infographics

An infographic is a medium used to visually represent information. With the use of both images and text, knowledge can be conveyed in an easily digestible format. The infographic found in our journal is an excellent example of how a combination of images and text can be used to explain a complex concept in an engaging manner.

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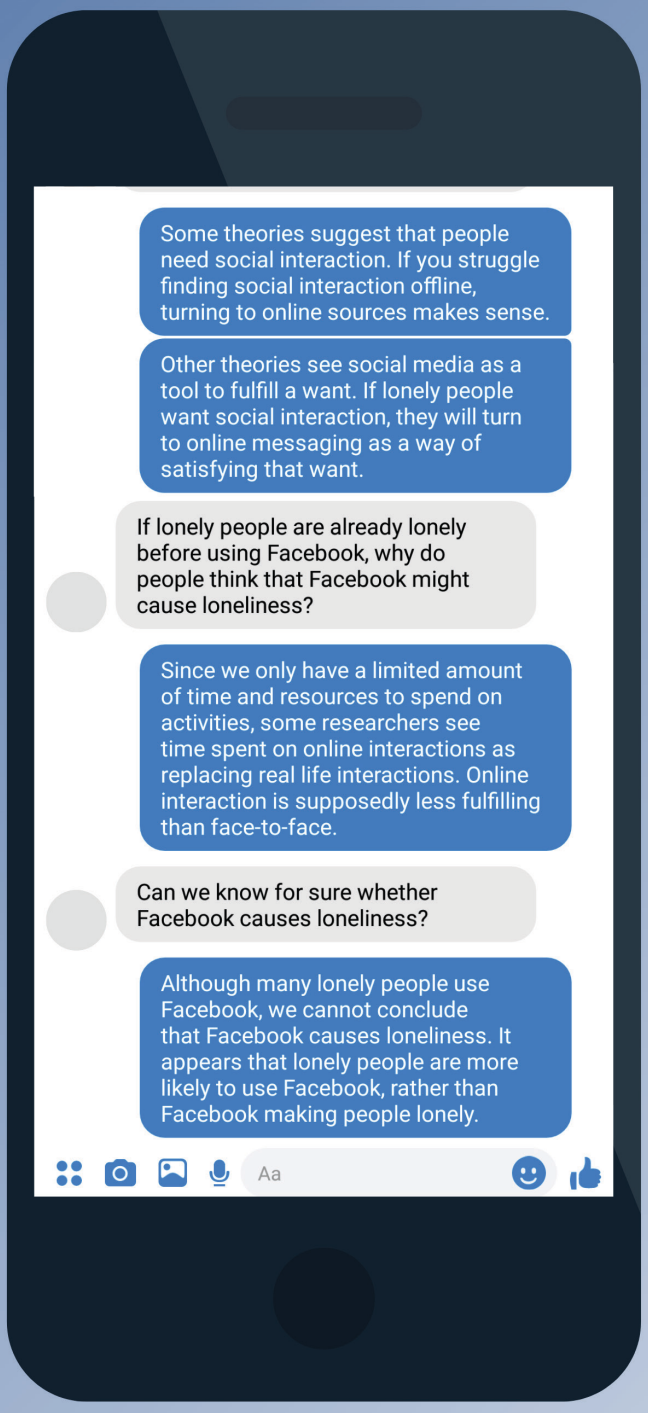
Does Facebook Make You Lonely?



further research

social augmentation hypothesis
social compensation hypothesis
displacement hypothesis
uses and gratifications theory

Song, H., Zmyslinski-Seelig, A., Kim, J., Drent, A., Victor, A., Omori, K., & Allen, M. (2014). Does Facebook make you lonely?: A meta analysis. *Computers in Human Behavior*, *36*, 446-452. http://dx.doi.org/10.1016/j.chb.2014.04.011

Infographic by Helena Schwade

Précis

A précis is a concise summary of the main ideas presented in a research paper, typically within a hundred words. It is a weekly assignment in PNB 2XD3, a mandatory PNB course that hones students' writing and editing skills. In creating a précis, the writer accentuates the importance of flow and brevity in writing. As a hallmark of the PNB academic life, it is only logical that a section highlighting excellent précis pieces be included in the Psynapse.

Creating a Healthy Stress Response System With Gut Bacteria

Article Collaborators

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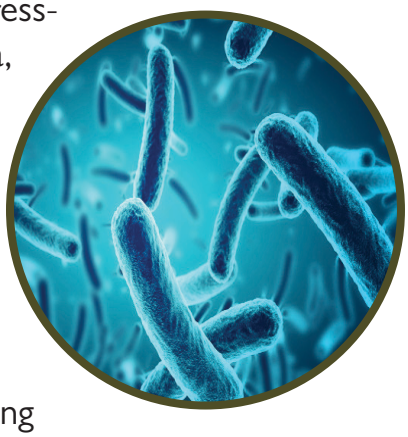

Gut bacteria play a role in the way mice respond to stressful environments. Mice that lack any gut bacteria, also referred to as germ-free mice, produce high levels of the stress hormones corticosterone and adrenocorticotropic hormone when presented with an environmental stressor. This high-level stress response can be diminished by transplanting the gut bacteria of healthy mice to germ-free mice. However, only young germ-free mice will display a decreased stress response following the replacement of their gut bacteria. Exposure to healthy gut bacteria must occur early in life for it to induce long-lasting improvements in the stress response system of mice.

Sudo, N., Chida, Y., Aiba, Y., Sonoda, J., Oyama, N., Yu, X. N., Kubo, C., … Koga, Y. (2004). Postnatal microbial colonization programs the hypothalamic-pituitary-adrenal system for stress response in mice. The Journal of physiology, 558(Pt 1), 263–275.

Rtrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1664925/

Model Dads: Midshipman Fish

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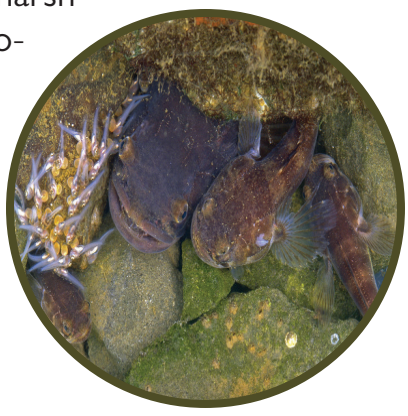

Plainfin midshipman fathers provide exemplary parental care. Plainfin midshipman fathers, which populate North America's Pacific coast, face challenging circumstances. In winter months, plainfin midshipman occupy deep waters, but later migrate up to the harsh intertidal zone during breeding season. Immediately following reproduction, midshipman females return to the Pacific, leaving the male midshipman to provide unassisted parental care. For the following three months, these fathers obsessively protect, clean, and care for their eggs. These parental duties require midshipman fish to endure periods of starvation and hours of daily air exposure. Despite such physiological distress, midshipman fathers never leave their brood; this willingness to suffer individual costs ensures the success of midshipman young.

Borowiec, B. (2019). Being a dad is hard when you're a plainfin midshipman fish. Retrieved from https://the-conversation.com/

Food Caching and Spatial Memory

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Variation in a bird's environment causes hippocampal adaptation based on the need for spatial memory. Animals use spatial memory to track their environment and orientation in space. Many bird species use spatial memory to locate cached food. Relative to those found in warm climates, birds living in cold climates must maximize their food security by caching food in many locations. Cold-climate species require enhanced spatial memory to better locate cached food as it accumulates. This demand for memory increases the size of the hippocampus—the brain structure responsible for spatial memory—through natural selection. Hippocampal changes ensure the survival of birds living in harsh environments.

Pravosudov, V. V. & Roth, T. C. (2013). Cognitive ecology of food hoarding: The evolution of spatial memory and the hippocampus. Annual Review of Ecology, Evolution, and Systematics, 44, 173–193. doi: 10.1146/annurev-ecolsys-110512-135904

Schizophrenia: Cultural Influences on Auditory Hallucinations

Article Collaborators

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Cultural differences influence the affective tone of auditory hallucinations. Schizophrenic auditory hallucinations present differently across cultures. In non-Western cultures, these hallucinations—often perceived as human voices—predominantly manifest as neighbours or family members, offering guidance and friendship. This occurs less often in Western cultures, where individuals are more likely to hear harsh voices encouraging violent behaviour. Individuals engage with the voices differently based on cultural expectations surrounding independence. In non-Western cultures, social roles and close relationships are fundamental. This reliance on social connectedness promotes the development of positive, personal relationships with the voices. In contrast, western cultures promote a disconnect from others, instead focusing on individual personality traits, abilities, and attitudes. Emphasis on these internal attributes leads Westerners to view the voices as negative, external intrusions. Thus, depending on an individual's cultural practices, the tone of schizophrenic auditory hallucinations may change. Therapies designed to modify the affect of these hallucinations can contribute to improved patient outcomes.

Luhrmann, T. M., Padmavati, R., Tharoor, H., & Osei, A. (2015). Differences in voice-hearing experiences of people with psychosis in the USA, India and Ghana: Interview-based study. The British Journal of Psychiatry, 206(1), 41–44. doi: 10.1192/bjp.bp.113.139048

Research Abstracts

An effective research abstract takes what might be an otherwise daunting paper and condenses its most central concepts into two to three hundred words of summary. The four abstracts that we have chosen to publish arrive from two different streams: the Psychology, Neuroscience & Behaviour thesis course and the annual BioPsych NeuroXChange conference (as demarcated by the NeuroXChange winner badge). We hope that you gain an appreciation for the breadth of psychological research being done at the undergraduate level across Ontario.

Elucidating the Role of Wnt Signalling in Brain Metastasis

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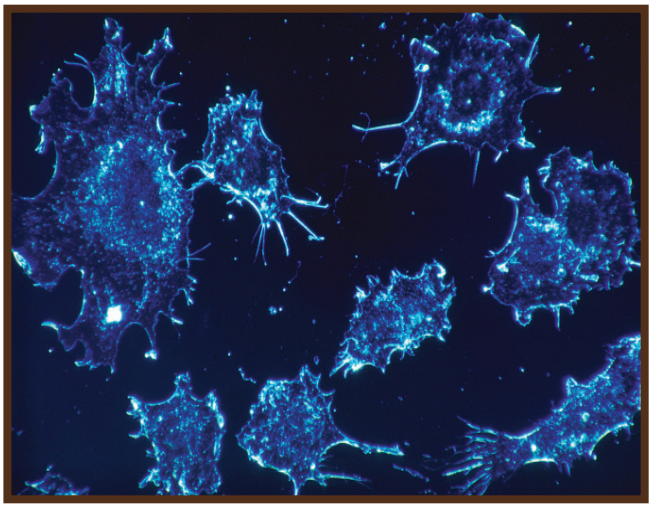
Brain metastasis (BM) is the spread of cancer to the brain. BM accounts for the majority of adult brain tumours, and commonly arises from lung, breast and skin cancers. Treatments include surgical resection and chemo-radiotherapy, which often yield incomplete eradication. In most tumours, the cancer stem cell (CSC) population possesses the ability to migrate to other organs. Upon investigating the CSCs in patient-derived BMs, the Wnt signalling pathway was shown as abnormally upregulated. Although present in healthy stem cells, Wnt can boost the functioning of CSCs when abnormally active. To study aberrant Wnt signalling in BM, Wnt signalling was activated and inhibited in BM cells in vitro. Wnt activation promoted BM growth, while Wnt inhibition stunted it. Activated Wnt also increased migratory abilities, validating the BM cells' metastatic capacity. These findings suggest a major role for abnormal Wnt signalling in BM, and may lead to the development of Wnt-targeted therapies.



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EEG-Based Visual Word Decoding from Perception and Imagery

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Internal representations subserving reading have been a highly studied topic in cognitive neuroscience. In the current work, we investigate the internal structure of visual word representations, and the relationship between perception and imagery-based representations in neurotypical adults. We utilize the spatiotemporal structure of electroencephalography (EEG) data to identify neural signatures associated with the structure of word representations. Specifically, we attempt to decode and reconstruct the appearance of four-letter words from perception and imagery using machine learning algorithms. Our results show that word classification and image reconstruction were successful and well above chance for perception. Imagery-based decoding of four-letter words was also successful. This has many implications both from basic and applied science perspectives (for instance, this form of "mind reading" could be used with patients in a locked-in state to aid communication). Collectively, our results further establish the feasibility of EEG-based word decoding and image reconstruction from both perception and imagery. More generally, they help elucidate the specific features, dynamics, and neurocomputational principles underlying word recognition and imagery. Future work aims to improve decoding accuracies using convolutional neural networks (CNNs) and to clarify the structure of imagery-based representations for reconstruction purposes.

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Chronic Aerobic Exercise as a Modulator of Cognitive Control

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Chronic aerobic exercise may facilitate plasticity in frontal brain regions associated with executive functions (Colcombe et al., 2004; Hottig et al., 2013; Guiney and Machado, 2013; Ludyga et al., 2015; Mcmorris, 2016). Evidence suggests that more active individuals generally perform better on tasks of inhibitory control (Guiney and Machado, 2013; Robertson et al., 2015; Cona et al., 2015; Martin et al., 2016); perhaps due to enhanced top-down cognitive control and conflict monitoring occurring pre and post-error (Themanson et al., 2006, 2008; Themanson and Hillman, 2006; Hillman et al., 2008;2009; Kamijo et al., 2013). In the present research, we therefore aimed to determine whether chronic aerobic exercise improves the efficacy of top-down cognitive control in response to differing levels of conflict. We hypothesized that enhanced cognitive control and pre-response conflict detection; reflected by a larger N2 ERP component would result in less post-error conflict; reflected by a smaller error-related negativity (ERN) amplitude. Furthermore, more active individuals were expected to respond more accurately and more quickly than non-active controls. 20 participants aged 18-25 were divided into the chronic aerobic exercise (CAE) group or the non-active group based on their responses to the International Physical Activity Questionnaire (2002). To be eligible for the CAE group, participants must be classified as high (>3000 METs); the non-active group was classified as low (<600 METs). Participants then performed a modified arrow-based Flanker task (Erikson and Erikson, 1974) in which conflict was modulated by the distance of the distractors from the target (close or far) (Danielmeier et al., 2009) and congruency of arrows (incongruent or congruent). EEG was collected while participants performed 800 trials over 4 blocks; 80% of trials were congruent and 20% were incongruent, 50% were close and 50% were far. The ERN and error positivity (Pe) were extracted by subtracting response locked correct

from error trials. The N2 was extracted by subtracting stimulus locked congruent from incongruent trials and the P3 was extracted from stimulus locked trials. There was no significant difference between the CAE group and the non-active group in terms of error frequency, reaction time or ERN amplitude. Mixed model ANOVAs with groups (between) and conflict level (within) as factors were used for analysis of ERP components (ERN, Pe, N2, P3). The CAE group showed a significantly larger Pe amplitude ($F1,16=6.57$, $p=0.021$) compared to the non-active group. Furthermore, close trials (more conflict) elicited a significantly larger N2 amplitude

than far trials in the CAE group, but not the non-active group ($F1,16=9.67$, $p=0.007$). Finally, the P3 ERP component was significantly larger for high conflict (close-incongruent, close-congruent and far-incongruent) trials than for low conflict (far-congruent) trials ($F3,17=7.52$, $p=0.003$); this same pattern was not observed in the non-active group. These findings suggest that CAE confers some cognitive benefit regarding the endogenous processing involved in pre-response conflict detection and the post-error response. These benefits may include enhanced adaptability in the allocation of cortical resources depending on task demands and more efficient evaluation of performance post-error.

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Residency Training May Be Key to Better Pain Management in Rheumatoid Arthritis

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Rheumatoid arthritis (RA) is a progressive inflammatory disease characterized by joint destruction, synovitis and autoantibody production (McInnes & Schett, 2011). Insufficient pain management is a major concern amongst RA patients (Heiberg & Kvien, 2002). Rheumatologists are not trained to address pain concerns and must refer RA patients to pain clinics, often with long wait times (American College of Rheumatology Pain Management Task Force, 2010). The current project aimed to summarize and improve RA pain management strategies and protocols, as well as make evidence-based recommendations to residency training curricula. Publications by the Canadian Rheumatology Association, the European League Against Rheumatism, and the American College of Rheumatology were consulted for disease treatment protocols and pain management strategies (Bykerk et al., 2012; Geenen et al., 2018; Singh et al., 2015). Training objectives for Canadian residency programs were obtained from the Royal College of Physicians and Surgeons (The Royal College of Physicians and Surgeons of Canada, 2019). The Cochrane Library was searched for systematic reviews on the efficacy of different treatment modalities. Evidence from reviewed publications indicated that pharmacological treatment for RA pain, such as analgesics, anti-inflammatory drugs, opioids, and anti-depressants, were at the core of pain management (Fidahic, Jelicic, Radic M & Puljak, 2017; Garner et al., 2005; Wienecke & Gøtzsche, 2004; Whittle, Richards, Husni & Buchbinder, 2011; Richards, Whittle & Buchbinder, 2011; Richards, Whittle & Buchbinder, 2012a; Richards, Whittle & Buchbinder, 2012b). Non-pharmacological treatments, such as cognitive-behavioural therapy and transcutaneous electrical neural stimulation therapy, were also recommended (Ferwerda et al, 2017; Brosseau et al., 2003). This evidence was used to provide guidelines for effective RA pain management techniques to the rheumatology residency curriculum. The project used the biopsychosocial perspective to develop a multi-disciplinary, patient-centred approach to treatment. The provided guidelines aim to equip rheumatologists with resources to address their patients' pain concerns in a timely manner.

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People of PNB

The Department of PNB is comprised of phenomenal individuals, be they faculty, post-undergraduate students, or current undergraduate students. Although the people of this department hail from a variety of diverse backgrounds, they all have one thing in common: engagement with scientific research and discovery. The purpose of "People of PNB" is to achieve an enhanced view of the people behind the monumental work being done here at McMaster. We hope that by providing an inside scoop into the background, interests, and career paths of McMaster's current researchers, our readers will gain inspiration to pursue their passions and get involved.

Dr. Katherine Holshausen

Dr. Holshausen is a staff psychologist in the Borderline Personality Disorder Service and Research Director of the Community Psychiatry Clinic. She began working at St. Joseph's Healthcare Hamilton in 2017. She is also an Assistant Professor in the Department of Psychiatry and Behavioural Neuroscience at McMaster University. Dr. Holshausen's research focuses on program evaluation and examination of symptomatic and functional outcomes following psychotherapy, with a specific focus on emotion regulation, borderline personality disorder, psychosis, and trauma.

> What made you want to pursue a career in clinical psychology?

I would say that as a clinical psychologist my initial interest—like most people, and even as cliché as it sounds—really came from wanting to help people. What I really liked about clinical psychology, was that it put a name to difficulties that people had in such a way that it made people feel less alone and more like there was a reason for feeling the way that they did, and that there were other people who experienced the same things as they did. I would say that, as I really came to understand what it meant to be a clinical psychologist, my favourite part of the profession is that clinical psychology is a real marriage between clinical practice and science. Psychologists are fortunate enough to be able to bridge the gap between these two areas in a way that can actually change people's lives using science.

> What is it like to work at St. Joe's and within your department?

Working at St. Joe's, we are lucky to have lots of psychologists working here. We have over 40 psychologists working at the hospital in different clinics and areas of expertise. In that sense, what it's like to work with all those psychologists is like working in a community. It's working in a community with like-minded people who are all in perpetual pursuit of findings ways to alleviate the distress that many individuals with mental health difficulties experience. Even though we have a large number of psychologists, most of the hospital is made up of allied health professionals. What that means is that a lot of the work is consultation and working with other kinds of healthcare professionals. It means there are continual opportunities to figure out where you fit in the landscape of healthcare, how your skillset is different and the same than that of other people, and how you can work together to incite real change for individuals who are really struggling.

> Please describe a typical workday

I'm not sure if I have a typical work day, everyday is different which is something that I both adore and struggle with. Most days include working closely with students, conducting research, talking about ongoing and upcoming projects, and how we can find ways to monitor and improve the clinical services that we offer at the hospital. Some of my days are spent doing direct clinical work—doing therapy and doing assessments with clients who come into the hospital. Some of my day is spent in meetings talking about policy implementation and policy change within the hospital and in the community, in consultation with our community partners. Some of my day is spent supervising graduate students in clinical psychology who are at different points in

Dr. Katherine Holshausen

their career as they work towards becoming registered clinical psychologists. It's exciting, sometimes overwhelming, but always inspiring.

> How do you deal with the stresses of work and research?

I think that that's a tough question because I think that I'm still unsure if I believe in work-life balance. I'm not sure if you can ever get to a place where you can truthfully say that you've achieved a work-life balance. I think it's a give and take, things eb and flow, I think if you do a job you love you will put more time into that and less time into other things that you love. Sometimes you have to take a step back and put your time into all the other things in life that you love, all the people in your life that you love, yourself, your hobbies, and the things that make you happy. If you're in a job that you love, lots of things will make you happy. So I think that I deal with that by telling myself that there is no such thing as failure in the pursuit of work-life balance and that every day is a new opportunity to ask myself how I would like to spend time that day. When I notice that I am out of balance, I take that seriously and I ensure that I always spend time with the people that I love and doing what I love – sometimes that's at work and sometimes that's outside of work.

> What advice do you have for students who are aspiring to pursue clinical psychology as a career?

A lot of people view clinical psychology as the one way to be a psychologist. I don't think that that's true. I think that one of the more important things to consider is are you thinking of becoming a clinical psychologist because you know that being a clinical psychologist means being a clinical scientist who also works face-to-face with individuals who struggle with their mental health or are you thinking of just working with people one-on-one and doing therapy and assessments? There are many ways that that can go, and it doesn't need to be by virtue of getting a PhD and certainly not by virtue of getting a PhD in clinical psychology. Advice for people generally, who are aspiring to pursue their PhD and thinking of acquiring a faculty position, I would say it's hard. And nothing worth having is ever easy and that you should go for it. The most that you stand to lose is not knowing whether or not you were going to get in in the first place or getting a no. But at least you went for it and have some experience. Concerning advice for those who are looking to get into graduate school, I would say that there are so many different things you can do to expand your experiences, knowledge, and skillset—it's never a good idea to pursue something because it will look good on your CV or resume. You should always choose things that are close to your heart. You should always choose things that inspire you because that makes it harder to make a misstep. I would say that it's important to find a mentor or mentors because it's a challenging field to get into and who you know can sometimes go a really long way. Having someone that you know who is supporting you and who is in your corner makes it that much easier to make it through.

"Concerning advice for those who are looking to get into graduate school, I would say that there are so many different things you can do to expand your experiences, knowledge, and skillset—it's never a good idea to pursue something because it will look good on your CV or resume. You should always choose things that are close to your heart."

> Please share an interesting event related to your career that you have experienced recently or in the past couple of years.

September 10th is World Suicide Prevention Day. I'm not sure if this qualifies as interesting, I will say that it does qualify as a touching event. St. Joe's put on a number of different events this past week. On September 17th, there were two events—there

was a play and a ceremony held in remembrance of people who have been lost to suicide. The reason that it stand out to me, is because in part I think that even when you work on the front lines with people who struggle with mental health and suicide everyday, sometimes we don't always take moments, or minutes, or hours to reflect on the fragility and beauty of what it means to be alive and how hard it can be for people to connect with reasons to be alive. It was an interesting and touching event in that it provided us an opportunity to stop and reflect on why we do what we do, why sometimes our work-life balance is out of balance, and how important it is to remember that we have an opportunity every day to change someone's distress and why we ought not to ever lose sight of it.

> Did you do your undergrad in a PNB related field or did you come to PNB in a later period in your career?

Yes, I did. I actually have my undergraduate in Psychology at McMaster, and I have a Bachelor of Social Science. I very much relate to what the PNB program is like at McMaster. I decided at some point in my third year that I wanted to be a Clinical Psychologist, and I never looked back.

> Please share something that you find peculiar about the PNB students department or in your lab

Something I find curious, maybe not peculiar, is that it's interesting to reflect on what it's like to be a PNB student now knowing that I was there as a PNB student 10 years ago. It's curious to hear that somethings and some people never change, some people's tests are still very very hard, teachers that I loved, appreciated and mentored me are still functioning in that role and are inspiring a new generation of students. I really enjoy those kinds of conversations where I can reflect back on my undergraduate experience because my experience as a PNB student is what got me to where I am today. So, it's an interesting experience to hear what has changed and what hasn't and how that affects students who are there now.

> What do you think is the greatest challenge facing students today?

I think the greatest challenge facing undergraduate students today is more than one thing. I think that one of the main things that I see in working with undergraduate students and general public, is that there seems to be very narrow ideas about what you can do with your career after you take psychology courses—whether you finish at the undergraduate level or you go onto the graduate level degree. I think that most people, when they hear psychology, think about a couch and talk therapy. In reality, psychology is a scientific area that can be applied in many broad ways. You can still be creative, you can still change people's lives, and you can still effectuate change, all using the same things you learned in both undergraduate and graduate school. I think the greatest challenge is having a sense of how to find your way, when you're in a very broad sort of field of study. Knowing what works for you, what doesn't work you, and how to get where you want to be—I think that is a very big challenge for students.

> If you could pick one notable individual in history who you think has the most tremendous impact on the field, who would that be?

In the late 1700's during the Enlightenment a movement to begin treating people with mental illness with compassion began. Philippe Pinel initiated one of the major proponents behind this movement. The notion that treating mentally unwell people in a humane manner was unheard of at the time. Stigma still exists today, but it is certain that we would not be where we are today if not for the efforts of Pinel.

Dr. Katherine Holshausen

Irina Ghilic

Irina Ghilic is a fifth-year Ph.D. candidate in the Department of Psychology, Neuroscience & Behaviour at McMaster University. Irina Ghilic completed her undergraduate and graduate studies in PNB. Her current research examines the ways to bridge the gap between applied cognition in education research, learning strategies, and teaching practices. As well, she works as a STEM Curriculum Developer at Enable Education.

> What are you currently studying, and what made you want to pursue this field?

I am entering my fifth year of Ph.D. studies; I'm a Ph.D. candidate in this [Psychology, Neuroscience & Behaviour] department, and my area of study is Applied Cognition and Education—so I learned about different cognitive areas and thought out experiments in the line of research that could apply cognition and those cognitive aspects and theories into an educational paradigm. And what made me want to pursue this field? It really started in high school—in Grade 11 physics, strangely. It was only my first year in Canada, but I had a fantastic physics teacher who taught us everything so well. He [the physics teacher] had labs that demonstrated how someone, whoever in history, got to a certain constant? So he'd be like, 'how do you even get that number, well this is how they got that number'. So his way of teaching—and the fact that I've learned so much, and how I didn't learn as much from other teachers—made me interested in, 'Okay, what makes a good teacher "good"', and how can you make students learn better?' So when I came to university here, and I went through my undergrad in PNB, I got interested in studies in education and started working as an undergraduate student with Dr. Joe Kim, who does research in education... and yeah, it's been a long history since.

> Who in the field has influenced you the most?

Our own Dr. David Shore. Hands down. After I graduated from PNB in undergrad, I worked for 3 years in the department as a curriculum assistant—as a staff member. And my direct boss was Dr. Shore, and after 3 years of working with him, I really thought that I was going to go for my graduate degree somewhere else, and I had actually applied. I had talked to a professor there and it was kind of all good to go, and then through a matter of a joke of Dr. Shore not realizing something about a student in his lab, I was like, 'Oh, maybe I can just sneak into your lab', and from that joke came the idea, 'Wait...why don't I apply to your lab?'. We had a great working relationship, he is a fantastic mentor. He always treated me as a colleague, not a student, and not an employee. Throughout all these years, he became a friend as well. So having him as supervisor, boss, mentor, friend—all of these have just taught me so much over the years. He's one to push you when you need pushing, [and] he definitely encourages you to step outside of your comfort zone. When I go present somewhere, or conferences, or even in my work now outside of McMaster, I feel more confident and more outgoing than I ever would have had before Dr. Shore taught me so much.

"...I feel more confident and more outgoing than I ever would have had before Dr. Shore taught me so much."

> Describe your typical weekday (i.e., morning routine, evening routine)

Well now that I'm working full time, and I'll also be TA-ing this fall, my morning starts fairly early. After years and years of failed attempts of getting ready in the morning, my routine has become fairly simple in terms what clothes I'm going to wear—I [also] have my lunch prepped. In this way, in the morning, I can take some time to either catch up on news, message family or friends, and then I usually crank up the music and just kinda take care of myself. Whether I am at home or I'm seeing no one that day, I think some sort of routine kind of just makes you feel like you're ready for the day. A routine can really can ground you. When I come home, I do like to cook, and then I will do something that's not work or school-related for at least an hour.

Something that I've done even before I started working full-time, as well as the last year and a bit of grad studies, has been, as a student, trying to have an early morning routine. I know it's very hard to go from being up really late and waking up late, but I found transitioning to an early morning routine and having those first few calm, quiet hours of the morning were very nice and peaceful and productive. For students, it may be hard to get into it, but if you do it with somebody else or with a friend, it becomes easier. I'm lucky to have my husband to do all the morning and evening routines with, but kind of creating a culture of 'this is our day and we're going to try to be productive, but also set aside time for ourselves' has been helpful.

> How do you deal with the stress of classes, work, and research?

First, time management. There was one term in which I was doing two independent modules as a graduate student, that's kind of like a QQ for undergraduate students. I was TA-ing a course, which was second year Cognition, a fairly intense course. And I was also teaching a course. I taught a third year multisensory mind course that Dr. Shore was so supportive of. I was probably working about 12 hour days. But I still didn't feel as run down as I probably would've if I didn't schedule things properly. At the beginning of each day, I would say to myself 'Ok, what needs to get done today or in the next few days'. Learning how to prioritize and, what I've learned over the years in grad school, are different self-care strategies. I think as a student, you're always thinking about school, and because you're in that student mindset, you often don't give yourself a break from it. I feel like guilt is a big thing. Even if you're taking a break from school work by watching Netflix movie, you might say to yourself 'But you didn't do schoolwork, you just watched something!'. That internal guilt in the background is like a big old beast that's just sitting on your chest. So I think letting go of guilt and just scheduling time just for yourself by going out with some friends, taking a nice bubble bath—I LOVE bubble baths—listening to something, or reading a book that has nothing to do with academia, are all very important so you can do well in your work, research and classes. Otherwise you may burn yourself out.

> What notable paper or recent paper have you read that you think other people should read too?

I've read so many papers recently and I was wondering if I can take the liberty and instead of saying a paper, recommend a book? I feel especially in academia, we get so busy reading papers that we sometimes forget about books. But, this is a book wherein at least one or two of the writers are in the field of cognitive psychology and how it applies in education. The book is called, Make It Stick. I've read that book years ago and I wish I would've read it as a student because it really teaches you in a very beautifully written way. It's not heavily scientific but it does have sources at the end so that you can read all the scientific papers. It teaches you how to become a more successful learner. And when some-

one, a psychiatrist, had asked me, about a book that I would recommend, I told him about this book and he went and read it on his flight back to the U.S. He loved it so much that he assigns it to his medical students, who have actually embraced it and they feel as though they really benefit from the teachings of that book. So, hopefully, whoever reads this, if you're interested and I mean, we probably have many copies in our lab as well, this book is definitely something good to read in order to improve your own learning.

> If you could go back in time, what is the one piece of advice you wish you could give your undergraduate self?

Ask for help when needed. I think I very much had the mentality of you know, 'just power through it', 'I can do this', 'I'm not gonna bother anyone'. I also came from a different cultural background, I'm an immigrant and coming into university, I didn't even think that you know, dropping a course that wasn't going so well for me was an option, I would have considered that as a failure or saw it as a failure—or even a course I wasn't particularly interested in as much. As well, I was not really seeking out all the wonderful resources we have on campus. And now as a graduate student, I became a bit more cognizant of them and aware of what I can get in terms of help. For example, there are writing services that can help you out. If you're graduating, there are people who can help you with your resume and job searches. If you're having mental health issues, there are at times long wait times, but there are resources and also I feel like your peers are also really great resources. So asking for help and not feeling like if you ask for help, you're 'weaker' by any means. It's okay to be not be okay.

"Ask for help when needed. I think I very much had the mentality of you know, 'just power through it', 'I can do this', 'I'm not gonna bother anyone'."

> Share a moment in your life that has had lasting impact on you, perhaps even shape who you are now.

Moving to Canada when I was almost 16. That's definitely a big one. I have lived longer in Romania than I have lived in Canada. I was thinking about why immigrating to a different country might seem like such a big deal. I think for me it was because I was mainly speaking a language that was not my native language. I dream in English now! It feels like my dreams are not the same. I'm dreaming in a different language which is so mind-boggling and interesting from a psychological perspective. I started dreaming in English a few years after I had moved here and it was a very strange transition. The educational systems were very different from in Romania compared to Canada. When I came here, they were going to advance me a grade, thanks to my math knowledge, but then they had to hold me back a bit because of English being my second language. So, the educational system was very different and that's what also got me interested in studying education. As well, just in general, the process of how someone goes to university and how someone applies to go to university is different. In Romania, I had to write exams and apply to go to high school. So I had to have good grades on my exams and from all my classes from Grade 5 to Grade 8 in order to be considered for a higher rated high school.

Here, the processes are very different in how you even get into university—you don't have an application exam in most faculties. I was in the Faculty of Science, so I just had to put in my application and only your grades mattered. I was very lucky to have fantastic friends in high school and then later in university that helped out. I didn't think that we were going to make it here...I was not so happy about that move—I had amazing friends back home, some of them I still keep in touch to this day. But I was very pleasantly surprised by everything that Canada had to offer me, so in a way I'm very lucky. I formed my life here now and I have amazing friends and my husband at Mac. But I think that kind of move sticks with you for a very long time.

Anita Acai

Anita Acai is a fourth-year Ph.D. candidate in the Department of Psychology, Neuroscience & Behaviour and the Office of Education Science, Department of Surgery at McMaster University. Her current doctoral research in the Performance Science Lab involves investigating how principles of social and cognitive psychology can be applied to improve training for physicians, surgeons, and other health professionals.

> What are you currently studying, and what made you want to pursue this field?

Right now, I'm doing my PhD in Psychology and I focus on health professions education or medical education research, which is a little bit different. My undergrad was actually in Biochemistry at the University of Guelph, and I had no idea that health professions education was even a field. I was doing research in biochemistry, and I realized that it really wasn't for me at all. I didn't really enjoy that area of study, so I had a bit of a career crisis in the middle of my undergrad and had to figure out what other path I would want to pursue. I really enjoyed teaching and learning, and so I decided to do my last co-op work term with a professor who specialized in biochemistry education and I really loved that. That's where I first discovered that you could even study health professions/medical education. So when I was thinking about graduate school, I wanted something where I could connect my background in science with my interest in education and so that's how I ended up coming to McMaster. Yeah... it was a very non-linear path.

> Who in the field has influenced you the most?

I don't think it's one person. I think I've been influenced by a lot of people. I think I try to learn from everyone I meet—but I would say for people who are considering graduate school that your supervisor will have a tremendous impact on your career trajectory and so, choose wisely. Think about who that person is and how you interact with them and get along with them. With that being said, I've had a lot of great mentors and including during my Ph.D. My supervisor has been really influential and you'll also find more and more role models as you go on.

> Describe your typical weekday (i.e., morning routine, evening routine)

One of the things that I like about academia is there isn't really a typical weekday, I would say. I spend a lot of my week meeting about research projects or thinking about research projects or doing research projects. When I'm not doing that, I spend a lot of time working with undergrads, whether it's in the lab or as a TA, and I really, really love that. I find it very rewarding, especially with the students in this department, cause they're awesome. When I'm not doing that, I also do quite a bit of service work. I'm a grad representative on the Senate here at McMaster for the Faculty of Science, so I am involved in many meetings in student governance. I also volunteer in my community at home, so I keep myself busy with that. And when I'm not busy, I try to just relax and take some time to also just not do

schoolwork and instead see friends, see family, do something fun,and watch really bad reality TV.

> What notable or recent paper that you've read that you think others should read too?

I actually did read a paper by Hyde which was talking about gender differences and I have a personal interest in that area, so I found it kind of interesting. She's the one who proposed the gender similarities hypothesis, which is that there are actually not as many differences between men and women as we like to think there are. She kind of breaks down the argument in that paper and provides some really good evidence for it, so I enjoyed that. And one of my favorite books is Tuesdays with Morrie, and it always has been. If anyone wants a book to read, that's probably what I would suggest.

> So what do you think is the greatest challenge facing students today?

When I was thinking about this, I thought, 'well, there are quite a few challenges.' I think the challenges are all sort of linked and they come from the the very changing and uncertain times that we live in. There are more career and educational opportunities than ever before, but at the same time, it can be overwhelming to choose between them. The kinds of careers that we have now are very different, so, in our parents' generation, one person might have had a job their whole life, but for us, careers are typically shorter-lived and we move from different jobs to jobs. I think that can cause quite a bit of anxiety and stress when people think about not meeting the same milestones that our parents met. As well, thinking about how hyperconnected we are as a generation. Especially on social media we tend to compare ourselves to our peers. I think that always makes us worry about whether or not we're living up to our potential. What we see on social media may be making us feel like we always have to prove ourselves to other people.

"I think the challenges are all sort of linked and they come from the the very changing and uncertain times that we live in. There are more career and educational opportunities than ever before, but at the same time, it can be overwhelming to choose between them."

> Share an interesting event that you experienced in the past couple of years or this past summer.

I actually just got back from Europe—I was there for a two week vacation. I was born in Serbia, but I'm ethnically Hungarian. There were a lot of border changes in that area, so this was the first time I've actually gone back to Hungary and really spent a lot of time there. Seeing what the country has to offer and exploring my heritage was really beautiful, and I got to go with some really good friends. It was awesome. The desserts were also really, really good.

> Share a moment in your life that has had lasting impact on you, perhaps even shaped who you are now.

I'd say that the biggest one professionally was when I had to change pathways in undergrad. I always envisioned a very linear pathway for myself. I was always very strong academically, and I didn't necessarily think about or wasn't actively aware that things may not work out the way I wanted them to. I just thought I was gonna go to school, then go to grad school and then get this great job as a cancer researcher. It never occurred to me that that may never happen, so it was really jarring to have to experience that, but at the same time, I ended up where I think I'm supposed to be. I'm doing what I actually enjoy doing, and I'm asking questions, and I'm learning. I think that's probably the most important thing - you have to be in a field where you really enjoy yourself and if you're in grad school - doing something where you actively are curious and actively want to know more about it.

Kiran Punia

Kiran Punia is currently a 2nd year M.Sc student in the Neuroscience Graduate Program at McMaster University. As an M.Sc student she works in the Integrative Neuroscience of Motivation & Change (INMaC) lab at the Peter Boris Centre for Addictions Research. Kiran completed her Honours B.Sc degree in Psychology, Neuroscience, & Behaviour at McMaster University. Kiran's research interests are in eating disorders, cannabis use disorder, and gambling disorder.

> What are you currently studying, and what made you want to pursue this field?

I am currently a 2nd year M.Sc student in the Neuroscience Graduate Program at McMaster. I really like Neuroscience and my program in particular as it is highly interdisciplinary and collaborative. Really, anyone from a chemist, to a biologist, to a clinical psychologist can be a neuroscientist. I wanted to pursue this field because I was interested in how addiction can affect the brain and behaviour. I conduct my research at the Peter Boris Centre for Addictions Research at St. Joseph's Healthcare Hamilton, where the centre is comprised of clinical neuroscientists and clinicians. As such, my program and field at large allows me to be at such a diverse research centre.

"I really like Neuroscience and my program in particular as it is highly interdisciplinary and collaborative. Really, anyone from a chemist, to a biologist, to a clinical psychologist can be a neuroscientist."

> Who in the field has influenced you the most?

Individuals in my field that have influenced me the most include my supervisor, Dr. Iris Balodis, along with the other two core faculty members of PBCAR, Dr. James MacKillop, and Dr. Michael Amlung. Through the various learning opportunities we have in the centre, to having causal conversations with the faculty at PBCAR, I am greatly influenced by their work and feel very proud to be apart of the quality research occurring at the centre.

> Describe your typical weekday (i.e., morning routine, evening routine)

A typical weekday for me is quite busy. I try to get most of my work done during the week so I can relax and enjoy weekends. I wake up, eat breakfast, and commute to St. Joes. My typical day consists of working on multiple projects at different stages, including writing, data analysis, running participants, submitting work, and training undergraduates. I also volunteer some days or have classes. Typically, when I get home I make sure to detach from work, and I do not check my emails. I then go to my workout class, eat dinner, and do a couple of hours of work and then try to go to bed early so I can wake up early and commute the next morning.

> What notable or recent paper have you read that you think others should read too?

Recently, my peers and professors at the Peter Bo-

ris Centre published a high impact meta-analysis examining delay discounting across addictive disorders, titled "Delay Discounting as a Transdiagnostic Process in Psychiatric Disorders: A Meta-analysis". This paper really speaks to the fact that although we tend to categorize psychiatric disorders, many of them share similar underlying features.

> What do you think is the greatest challenge facing students today?

I think a big challenge is managing stress and time management (at least it was and still is for me!) I think we all try to take on as much as we can, but really, I think we should dedicate some time to a few activities that we are very passionate about. Now being in graduate school, my plate is always full. Unlike in undergrad, where after midterm season you get a break, I like to describe graduate school as one big midterm/exam season. Therefore, a major challenge is finding a balance between having a never ending to do list, but also making time for hobbies and activities outside of work.

"...a major challenge is finding a balance between having a never ending to do list, but also making time for hobbies and activities outside of work."

> If you could go back in time, what is the one piece of advice you wish you could give your undergraduate self?

If I could go back in time one piece of advice I would give my undergraduate self would be to be more involved. I got more involved within my program in my last year, but I definitely wish I would've sooner!

> Share something you find interesting or peculiar about the PNB students/Department/your lab.

I think something unique about the PNB department as an undergrad was how close-knit the students and faculty were. I feel very lucky to be in a research centre with the same type of closeness among students, staff, and faculty now in graduate school.

> Share a moment in your life that has had lasting impact on you (perhaps even shaped who you are now).

I think a moment that has had a lasting impact on me was visiting my grandpa's village in India as a child. He immigrated to Canada with my grandma in the 60s, and to see where he was from and the conditions in which he lived in, and how he dreamed big and achieved his goals is always very inspiring to me and shaped me into who I am.

> If you could pick one notable individual in history who you think has the most tremendous impact on the field, who would that be?

Since I am in Psychology, I think I definitely have to say Freud! It would be so interesting to talk to him about his theories and all the conspiracies surrounding them.

> How do you deal with the stresses of classes, work and research? (self care, hobbies, etc).

I deal with stress by making sure I have enough time to myself and no tasks to do for half an hour after I wake up and before I go to sleep. I also really enjoy exercising, and meditating. Self-care is so important!

> Share an interesting event you have experienced in the past couple of years (or this past summer).

An interesting event I have experienced this past year was publishing my first paper. It made me really excited to see my work in a journal, and is motivating me to get my other work published.