

## Fresh Ideas: Side by Side Summer Research Program Conference 2021



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### Abstract

Side by Side Agency (SBS) is a student-led educational non-profit based in the Greater Toronto Area. We began by providing free virtual tutoring and mentorship for K-12 students to compensate for pandemic-related educational disruptions. When school services returned, we switched gears to focus on persisting barriers to academia for marginalized students primarily addressing inconsistencies in research education across Ontario. Literature on Canadian undergraduate students' literacy and research skills affirmed our personal difficulties with entering the research field, motivating us to develop a free, accessible, and supportive beginner research program for high school students. The 2021 SBS Summer Research Program (SBS SRP) was developed by undergraduate volunteers and included weekly lessons, workshops, homework, and guest speakers to cultivate research skills and inspire curiosity. Students worked with undergraduate mentors to pursue research projects of their interest in fields such as neuroscience, public health, and sociology. SBS SRP culminated with our conference, where students presented their literature reviews, proposed studies, and informative social media campaigns. Check out [our website](#) to view our students' presentations and learn more.

**Keywords:** myopia; homelessness; psychedelics; prebiotics; memory; sleep

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### Conference Abstracts

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#### Treatment methods used to reduce myopia progression in children: A literature review

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**Introduction:** With the rapid growth of technology, children often experience increased eye strain as more time is spent on tablets, computers, and other screens. This leads to less blinking and increases the likelihood of dry eyes, a common risk factor for eye diseases such as Myopia, or nearsightedness. This review aims to compare and discuss current treatment methods for myopia among children.

**Methods:** A literature review was performed to summarize existing research on potential treatment methods for the progression of childhood myopia.

**Results:** Three main treatment options were discovered: bifocal lenses, atropine therapy, and antimuscarinic topical medication. Bifocal lenses correct vision in addition to preventing further changes to the shape of the eyeball. Atropine therapy reduces elongation of the axial length by dilating the pupils, decreasing the likelihood of light focusing in front of the retina. Antimuscarinic topical medication dilates the pupils through inhibition of iris sphincter muscle contraction.

**Discussion:** Studies on bifocal lenses suggest that further investigation of the role of the peripheral retina in ocular growth regulation, or myopia progression, is needed. However, bifocal lenses remain a reliable treatment method as numerous studies demonstrate success in decreasing myopia progression with minimal limitations in research methodology. Atropine therapy poses greater costs and less long-term effectiveness due to non-compliance with the necessary daily administration. The lack of efficacy testing also compromises the reliability of this method. Antimuscarinic topical medication appeared to be the least effective treatment method of the three, as further vision impairment was reported as a side effect, indicating more studies are needed to assess safety and efficacy.

**Conclusion:** Although many treatment options for myopia have been explored, it remains unclear which treatment has been the most effective for children. The larger body of research available on bifocal lenses may indicate this method to be the most worthwhile option. Meanwhile, atropine therapy and antimuscarinic topical medication have the potential to prevent or treat myopia progression, but further research is necessary.

### **The epidemic of race & homelessness in the greater Boston area: A research study**

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**Introduction:** Homelessness is a global epidemic that is exacerbated in Boston with rates that are six times higher than the national average. These rates are augmented further in Black, Latinx, and Native American communities. Massachusetts is technically a 'right to shelter' state; however, these rates of homelessness highlight a gap in service provision to communities of colour.

**Methods:** A literature review was conducted to identify potential reasons for the high rates of homelessness despite the 'right to shelter' policy. Included articles and reports were published between 2000-2021 with information which either coincided or provided rationale for the phenomenon. The following search terms were included: 'race in homelessness,' 'race in Boston,' 'homelessness in Boston,' and 'homelessness Massachusetts.'

**Results:** The review presented three key factors that provide a degree of explanation for the epidemic studied: structural social inequity, economic inequality/gap, and increasingly high housing prices. Structural social inequity consists of discrimination in criminal justice, premature death, and the downstream effects of discrimination (effects including but not limited to unemployment, lower income, high school non-completion and criminal justice involvement) that make it increasingly difficult to either become financially stable or qualify for government subsidies. The racial economic inequality perpetuates itself in wealth in Boston leading to housing insecurity when combined with high housing prices. Massachusetts has the third highest income level required to afford housing in the United States, rendering the cost burden (when one must spend more than 30% of their income on rent) to be 50% for the Native American population, 53.5% for the Latinx population, and 54.9% for the Black population. This is 12.3% higher than the white population at 42.6%. Due to the high nature of rent, property also tends to be passed down from generation to generation leading to housing in addition to wealth being inherited creating a closed system to immigrants and individuals not born into wealth.

**Conclusion:** With structural and wealth inequalities being primary perpetrators, homelessness is pinpointed to be a systemic race issue that temporary solutions have been unable to unravel. Homelessness continues to aggravate everywhere, not just Boston, but Boston exemplifies a case where a place seems to succeed and grow, but begs the question for whom?

### **Legalization and ethics of psychedelic use: A literature review**

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**Introduction:** Psychedelic drugs can supplement psychotherapy for psychiatric illnesses, but there are complex moral dilemmas surrounding their usage, especially for recreational use. Psychedelics can instill transient alterations in emotions, perceptual processing, understanding of oneself, and awareness of interpersonal connectedness. These effects may result in

meaningful spiritual experiences and have been shown to ameliorate psychiatric illnesses (i.e., major depressive disorder, obsessive-compulsive disorder, post-traumatic stress disorder) and psychological symptoms of cancer. Through targeted support and guidance, psychedelics may offer therapeutic experiences that address rather than suppress adverse emotions and memories. While psychedelics have been shown to deliver effective treatment and pleasure, the current lack of knowledge and legalization generates concerns for safety.

**Methods:** A literature review was conducted to examine commentary, observational, and experimental scholarly journal articles from 2013 to 2020 sourced through Google Scholar to summarize research findings on medical, legal, and recreational psychedelic use.

**Results:** Effects and methodology for psychedelic use were listed, including benefits and consequences for medical full-dose patients and recreational micro-dose users. However, there were also concerns about the inadequate quality and quantity of research on psychedelic use.

**Discussion:** Existing literature suggests that the legalization of psychedelic use must include rigorous further research and the establishment of safety precautions for users and prescribers of medical and recreational psychedelic usage. These precautions would include informing psychiatric patients and recreational consumers about the known effects of psychedelics and the scarcity of research. Additionally, research, access, and legalization should be prioritized for psychiatric full-dose patients over recreational micro-dose patients. Dispensaries and pharmacies would furthermore require training in proper preparation, supervision, and integration to avoid adverse experiences. Psychedelics should be based on the premise of choice for those aware of psychedelic effects and legalized for those at least 25 years of age because the prefrontal cortex would fully develop and hold the intellectual capacity to make these risky decisions.

**Conclusion:** Psychedelic drugs should be legalized under certain restrictions for their therapeutic potential in major depressive disorder (MDD), obsessive-compulsive disorder (OCD), and post-traumatic stress disorder (PTSD) for recreational and psychiatric patients, especially following the pandemic-caused mental health crisis.

### **The effect of prebiotics on curing symptoms of anxiety through the gut microbiota compared to anxiolytics:**

#### **A research proposal**

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**Introduction:** Anxiety disorders have a multitude of causes and effects leading to variance in potential treatment options and in their efficacy. Existing medication-based treatments fail to consider other potential sources for the mitigation of symptoms with less severe side effects. An understated link between such issues is the general health of the gut microbiota and the impact that it has on symptoms of generalized anxiety disorder (GAD). We hypothesize that anxiolytics will decrease the diversity of the gut microbiota, whereas prebiotics will improve bacterial diversity. Regardless, we hypothesize that anxiety will be managed similarly with both treatments.

**Methods:** To address this question, we propose the use of clinical trials. In brief, 35 individuals will be recruited and divided into 2 main groups based on diagnosis of anxiety (healthy control group and anxiety diagnosed group). Patients will be age and sex matched and ideally from the same family. Trials will be conducted for a period of 9 months with blood tests and stool samples taken every 3 months. Following this, a FMT (fecal microbiota transplant), will be performed in germ-free mice using fecal samples obtained from patients to observe and compare the effects of anxiolytics and prebiotics on the brain and on species of *Bifidobacterium*, *Lactobacillus*, and *Lactococcus*.

**Results:** We expect anxiolytics to decrease the number of species in the gut microbiome and aid in managing symptoms of anxiety. In contrast, we expect prebiotics to aid in increasing the number of species in the gut microbiota which will aid in managing symptoms of anxiety.

**Conclusion:** As evidence increases regarding the efficacy of prebiotics on anxiety disorders, researchers in the field of psychiatry should look deeper into the importance of nutrition. Further research can be conducted regarding specific diets and foods and their impacts on specific psychiatric disorders and the gut microbiota.

### **Slow wave sleep and REM sleep awakenings do not affect sleep dependent memory consolidation: A literature review**

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**Introduction:** Memory consolidation is a process by which recent learned experiences are transformed into long-term memory. Rapid eye movement (REM) sleep benefits learning and sleep-dependent memory consolidation. The third stage of sleep is slow wave sleep (SWS), during which slow waves are produced in the medial prefrontal cortex (mPFC). The mPFC deteriorates with aging which is associated with memory loss.

**Methods:** A literature review was conducted in order to summarize the effect of REM sleep and SWS deprivation on sleep-dependent motor and declarative memory consolidation. Peer-reviewed studies conducted on young healthy volunteers published between 2005-2009 were included.

**Results:** Although REM sleep and SWS awakenings led to a significant reduction of the respective sleep stages, memory consolidation remained unaffected. Instead, improved memory consolidation was significantly associated with sleep spindles, hallmarks of non-REM sleep.

**Conclusion:** The literature indicates that a severe decrease in the total amount of REM sleep or SWS does not affect performance in learning tasks of young, healthy volunteers.

#### **Conflicts of Interest**

The author(s) declare that they have no conflict of interests.

#### **Authors' Contributions**

JL: founded the Side by Side Summer Research Program and Conference, served as a planning committee for the conference, drafted the conference abstract booklet, reviewed the abstract submissions and ensured that they adhered to correct formatting standards, and gave final approval of the version to be published.

AZ: founded the Side by Side Summer Research Program and Conference, served as a planning committee for the conference, drafted the conference abstract booklet, reviewed the abstract submissions and ensured that they adhered to correct formatting standards, and gave final approval of the version to be published.

VD: founded the Side by Side Summer Research Program and Conference, served as a planning committee for the conference, drafted the conference abstract booklet, reviewed the abstract submissions and ensured that they adhered to correct formatting standards, and gave final approval of the version to be published.

#### **Acknowledgements**

A special thank you to our volunteers who developed lesson plans, ran workshops, and mentored individual research projects throughout the summer research program. These include Cassie Yang, Emma Jennings-Fitz-Gerald, Faiyaz Zaman, Fariya Ali, Hannah Rajput, Ivan Ntale, Kelvin Ng, Lauren Levy, Lindsay Smith, Mathew Shmoon, Maya Paris, Merin Kurakose, Michelle DeSouza, Nayanan Nathan, Nishita Gandhi, Rue Sriharsha, Vicki Zhang, and Yilian Tian. We also appreciate the time and efforts of our incredible guest speakers, advisors, and supporters.

#### **Funding**

No funding was obtained for this project.

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#### **Article Information**

Managing Editor: Jeremy Y. Ng

Article Dates: Received Feb 09 23; Published Apr 03 23

#### **Citation**

Please cite this article as follows:

Linga-Easwaran J, Zhang A, Dib V. Fresh ideas: Side by Side Summer Research Program Conference 2021.

URNCST Journal. 2023 Apr 03; 7(4). <https://urncst.com/index.php/urncst/article/view/466>

DOI Link: <https://doi.org/10.26685/urncst.466>

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