Five selected abstracts from *ASCI*4010: Arts and Sciences Honours Research Seminar*

Overview

This series features a selection of five abstracts from projects completed as part of the Winter 2017 iteration of *ASCI*4010: Arts and Sciences Honours Research Seminar*, a capstone course for students enrolled in the Bachelor of Arts and Sciences (BAS) program. The course is designed to provide students with an opportunity to integrate their research interests in the arts and sciences and to produce an extended, interdisciplinary term paper under faculty supervision. Students enrolled in the course are also given the chance to share their investigations with classmates and with the University of Guelph's larger research community through a day of poster presentations. The abstracts collected here attest both to the interdisciplinary spirit of the BAS program and the varied research interests of its students.

Keywords: Bachelor of Arts and Sciences; BAS; ASCI 4010; College of Arts; University of Guelph.

Musical frisson: A chilling insight into the emotionality and physicality of music

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The term “musical frisson” refers to the chill-like sensation, usually accompanied by goosebumps, experienced when listening to emotionally moving music. Roughly two-thirds of the population have experienced this phenomenon, and it is generally perceived to be a pleasurable experience. While music is not the only stimulus that can elicit frisson, it is both a reliable and a common one. The present investigation hypothesized that individuals who experience frisson have a stronger emotional response to the eliciting music than those who do not experience frisson. From this hypothesis, an important question about directionality arose: is it the strong emotion that leads to the frisson, or is it the frisson that enhances the emotional response? A literature review assessed the research concerning the physiological experience of goosebumps, the brain regions involved in emotion, neurotransmitters implicated in emotion and in frisson, individual differences which increase the likelihood of experiencing frisson, and the musical elements most likely to elicit frisson. An assessment of the literature preliminarily indicated that individuals who experience frisson in response to music do indeed have strengthened emotional responses to

music. In terms of directionality, it was concluded that the strong emotional response leads to the physiological experience of frisson, rather than frisson leading to a strengthened emotional response. The pleasure derived from listening to music results from the release of the neurotransmitter (NT) dopamine in the brain. The sympathetic division of the autonomic nervous system in turn causes the frisson response through the release of the NT epinephrine (adrenaline), and is thought to be mediated by another NT, endorphin. The current study posited that dopamine release when listening to pleasurable music leads to endorphin release, which in turn leads to the physical frisson response via epinephrine. When the sympathetic nervous system releases epinephrine, the muscles connected to the hair follicles contract, causing hairs to stand on end and the individual to experience a chill-like sensation. The experience of musical frisson, however, is more common among individuals who have higher levels of openness to experience (as measured by the Five Factor Model of personality). Certain musical elements, such as appoggiaturas, crescendos, and the violation of expected harmonies and melodies, were found to elicit frisson more reliably than other musical elements. These elements are related to the emotionality of musical experience, confirming that the strengthened emotion response leads to the frisson. This investigation helps to shed light on how pleasure is derived from music, and adds to our understanding of the science and psychology of musical experience.

Elucidating the effects of improvisational music therapy for evidence-based and effective practice: A neurobiological approach

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This paper explores the techniques and methodologies, clinical research, and the associated neurobiological mechanisms of improvisational music therapy (IMT), and develops an understanding of how more effective, evidence-based methods of therapy and assessment can be implemented in the field. Although some research has investigated the application of neurobiological mechanistic knowledge towards the formation of therapeutic methodology, there are still large gaps in both our understanding of certain mechanisms, and in the evidence base for the effectiveness of certain methodological approaches and assessment protocols. This paper draws from literature on the techniques and methodologies, clinical research based on methodological approaches (mostly randomized control trials and reviews) and their therapeutic value for specific populations, and specific neurobiological mechanisms and their application to music therapy. Some recurring concepts, themes, and problems found in the literature include the use of musical experiences to practice non-musical experiences; the use of particular methodological approaches for specific populations; the use of subjective assessment protocols regarding social, mental, and physical abilities; the assessment of neurobiological mechanisms as biomarkers for therapeutic effects; and ensuring that therapists are engaging in effective practice. The aim of this paper is to review relevant literature and make suggestions regarding how a better understanding of the methodologies and neurobiological mechanisms associated with IMT can help to develop more effective therapeutic approaches, geared towards unique aspects of the individual and their disease/disorder etiology. In order to progress our knowledge and understanding of this modality of therapy, and to make sure that therapists are engaging in the best possible practice, a holistic approach is required, which includes a concrete, evidence-based understanding of the neurobiological mechanisms involved, as well as an understanding of the most effective ways to implement this knowledge in practice.

Behavioural outcomes of genetic risk information

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Genetic risk information for complex chronic diseases has been hailed as an opportunity for treatment personalization and increased patient engagement within healthcare systems. To evaluate the application of genetic risk information for chronic diseases, this paper examines the effectiveness of genetic risk information in eliciting health-related behavioural change, as well as factors that are hypothesized to impact health-related behavioural change. A literature review examined the effectiveness of genetic risk information in eliciting lifestyle modification compared to other kinds of risk information (namely biomedical risk assessment, family history-based risk assessment, and non-personalized risk assessment). Generally, there was no significant difference in the behavioural changes elicited by these types of risk information. There was, however, a modest increase in health-related dietary change in response to genetic risk information compared to other types of risk information. The literature also indicated that the strongest predictor of an individual's behaviour after receiving genetic risk information was the individual's behaviour at baseline. Research on the behavioural outcomes of genetic risk information is still premature and requires increased methodological rigor, particularly through an increased focus on randomized control trials and empirically-based measures of health outcomes. Theories of health-related behavioural change were examined to predict responses to genetic risk information, and to identify potential means of improving the effectiveness of genetic risk information in eliciting health-related behavioural change. Social cognitive models of health-related behavioural change, including the Health Belief Model (which holds that an individual's likelihood of taking recommended preventative action is influenced by perceived barriers to, and benefits of, health-related behavioural changes, the level and extent of the perceived health threat, and cues to action), and the Common Sense Model (which maintains that an individual's cognitive representations of an illness activate coping behaviours which are aligned with those representations) were examined. While these social cognitive models give some context to the factors that may affect the effectiveness of genetic risk information in motivating health-related behavioural change, they are overly simplistic and individualistic in nature, neglecting social factors and communication practices which may impact whether or not an individual makes behavioural changes in response to genetic risk information. Given this lack of efficacy in

motivating lifestyle modification, providing genetic risk information for complex chronic disease has limited utility at present, but is an avenue which merits further investigation and development.

The most dangerous videos online: Analyzing the effectiveness of ISIL's recruitment videos and of current digital counter-terrorism strategies

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The world of terrorism has seen a shift in its style of execution. Homegrown terrorism has supplanted larger attacks orchestrated centrally by terrorist organizations. Homegrown terrorism is the phenomenon in which an individual or group, in geographic isolation from the terrorist organization with which they become aligned, radicalizes and commits or plans to commit a terrorist act in their country of residence, origin, or in other primarily Western states. The Islamic State of Iraq and the Levant (ISIL), an extremist Sunni organization, has proven extremely capable of recruiting and mobilizing homegrown terrorists, especially by using the internet as a means of radicalization. Research on the psychology of radicalization identifies several stages and common features of the radicalization process. These stages include a personal crisis (the loss of a loved one, for example), the pursuit of increasingly extremist forms of religion as a solution to the individual's plights, and a form of in-group psychology. This project aimed to identify common themes and methods used in ISIL recruitment videos, to comment on the videos' effectiveness in relation to the common stages of the radicalization process, and to discuss the efficacy of digital counter-terrorism techniques. The common features of the radicalization process were coded in order to perform a content analysis of a publicly-available ISIL video, "There Is No Life without Jihad." It was found that the video's content corresponds to the common stages and features of the radicalization process. In other words, the video's content is tailored to appeal psychologically to individuals going through the main stages involved in the radicalization process. To combat these psychologically effective videos, three forms of digital counter-terrorism have been deployed, namely disruption, or the removal from websites of dangerous material and terrorist-linked accounts; diversion and alternative engagement, in which paid advertisements are deployed by counter-radicalization organizations to re-route those searching for extremist content; and countermessaging, whereby counter-radicalization material is broadcast. Of the three, disruption is believed to be the most effective, as it

forces extremist groups into the dark-web, limiting the accessibility and spread of their content. In the dark-web, terrorist organizations' activities are both less accessible and traceable, a trade-off which security agencies are willing to make. In conclusion, ISIL's videos, whose content appeals to specific stages of the radicalization process, are psychologically effective in radicalizing individuals abroad. Disruption, however, renders them less viable by limiting their effective reach.

The future of probiotics: The fight against youth mortality and community poverty in sub-Saharan Africa

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This project investigates probiotic treatments for malnutrition and infectious diseases in sub-Saharan Africa by examining their biological mechanisms and evaluating current healthcare infrastructure in the region. Human growth and development depends greatly on the role of the gut microbiota. However, those who suffer from malnutrition and infectious disease usually have an impaired microbiota composition, which reduces their ability to combat pathogens. This can lead to stunting, wasting, severe diarrhea, and ultimately death, if there is no medical intervention. Researchers have found that certain probiotic strains such as *Lactobacillus rhamnosus* and *Streptococcus thermophilus* have the ability both to replenish the diminished and weakened microbiota and to carry out mechanisms which combat the presence of pathogens in the intestine. As a result, probiotics can play a crucial role in reducing the high mortality rates associated with severe infant diarrhea. Additionally, probiotics can aid in stimulating the different arms of the immune system, which help the host fight and recover from infections. This research concludes that probiotics have the potential to become an effective measure in preventing malnutrition and susceptibility to infectious disease from a very young age. However, the efficacy of this intervention depends on local government support, sufficient funding for scientific research, and better healthcare infrastructure in both rural and urban regions. With these administrative conditions met, probiotics can become an effective form of medical intervention. This would have the potential to help establish a generation of strong, healthy children who are able to receive an education and increase labour productivity in their communities. Ultimately, this may help to alleviate the cycle of poverty that plagues many sub-Saharan African communities, a cycle which results from high levels of morbidity and mortality.