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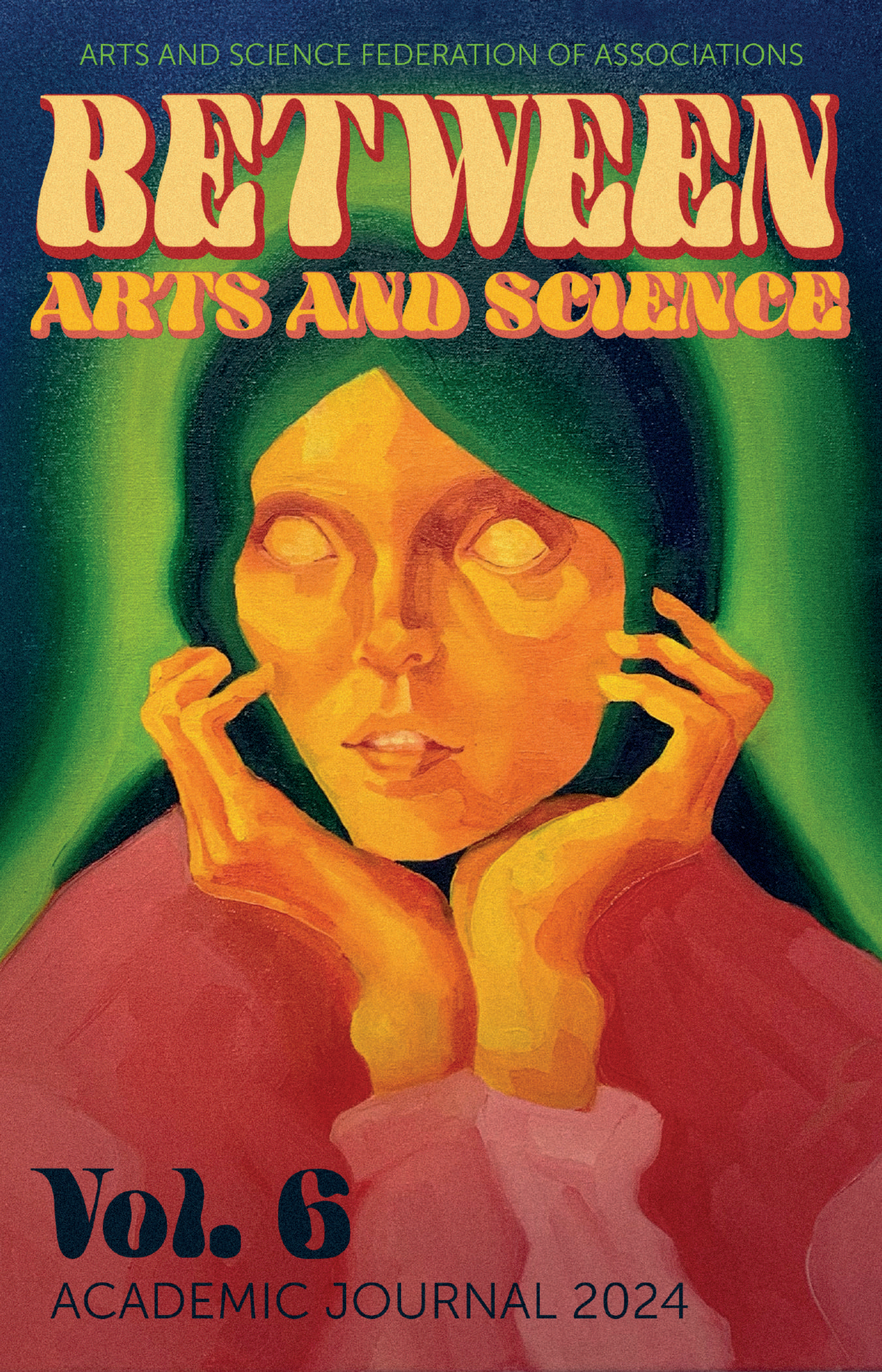
BETWEEN ARTS AND SCIENCE



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ABOUT THE COVER ART

Regina 2024, 30 x 30" Oil on Canvas.
By Claire Wiebenga.

This piece is about self-perception. The idolization, doubts, fantasies, and jealousies that make up our sense of being. It is an assurance and reassurance. A way of recognizing and challenging the self that looks back at you.

Claire Wiebenga is a multidisciplinary artist, designer, and writer currently practicing, experimenting, and studying out of Concordia University in Tiohtià:ke Montreal.

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PREFACE

A WORD FROM THE EDITOR-IN-CHIEF

Dear Reader,

It is with great pride and enthusiasm that I present to you the sixth volume of ASFA's Academic Journal, *Between Arts and Science*. This journal, a student-founded, student-run initiative, stands as a testament to the incredible talent and diversity of undergraduate students within the vast Faculty of Arts and Science. Our journal brings together work from a wide range of disciplines, reflecting the rich variety of academic pursuits and creative endeavors that thrive within our faculty.

Publishing one's work is an opportunity that not every undergraduate student has the chance to experience. At ASFA, we are fortunate to have the resources and support necessary to run this journal, providing a platform for students whose exceptional work deserves to be shared with the world.

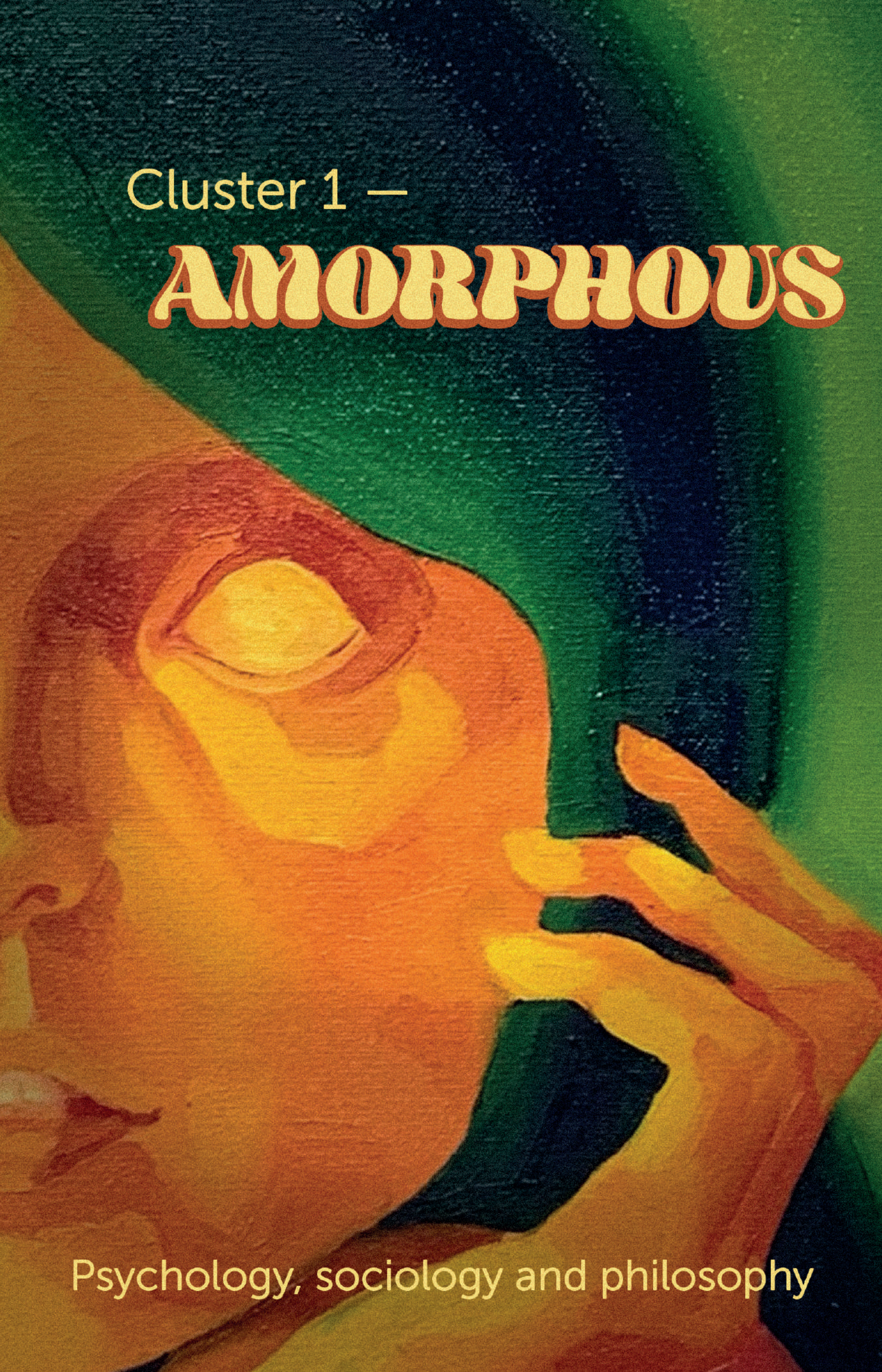
This edition of the journal presented unique challenges. Unlike some previous editions, we chose not to limit submissions to a specific theme. Instead, we embraced the diversity of ideas and disciplines across our faculty, allowing the creativity and academic rigor of our students to shine through. Additionally, the student strikes that occurred during the academic year introduced further difficulties, slowing down our progress and limiting the time and resources available for this project. Despite these obstacles, our team worked tirelessly to accept, edit, review, and publish all submissions within a very tight timeframe.

We are excited to present you with 17 articles in this edition, each one a reflection of the dedication and hard work of our authors. We hope that this journal inspires other students to continue creating, writing, researching, and publishing within the Faculty of Arts and Science and Concordia as a whole.

As the Editor-in-Chief of *Between Arts and Science*, and on behalf of all of the editorial team, I am immensely proud to introduce Volume 6 of ASFA's Academic journal. This edition is a true reflection of the resilience, creativity, and dedication of our student body, and I am honored to have played a part in bringing their work to the forefront.

Berlant AlSabbagh

Editor-in-Chief, *Between Arts and Science*


Cluster 1 –
AMORPHOUS
Psychology, sociology and philosophy

 https://doi.org/10.70578/AFXI2522

HEART AND/OR HEAD?

STUDY, EMOTION, AND AUTHORITY IN *A COMPLICATED KINDNESS* AND *WE MEASURE THE EARTH WITH OUR BODIES*

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Louise van Oel is completing a BA Joint Specialization in English and History, with a minor in Professional Writing. This work was written for ENGL 377, Contemporary Canadian Fiction, under Dr. Alexandra Kakon of the English department at Concordia University.

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ABSTRACT

This paper critically analyses the definition and delineation of knowledge in the novels *We Measure the Earth With our Bodies* (Tsering Yangzom Lama) and *A Complicated Kindness* (Miriam Toews). Focusing specifically on the legitimisation of knowledge by Western authorities and the difficulties (marginalized) women face in defending the legitimacy of their own positions, the argument is made that the emotional can coexist with knowledge, without by definition tainting it. To study with feeling is not necessarily to corrupt the truth: acquiring information and the act of studying it can be an essential part of forming identity. It is the forming of this individual identity (by young women in particular) which authorities such as academic institutions and the church seek control over. They claim that objectivity can only be legitimated by institutions such as themselves, and that objectivity is the only correct way to view and acquire information, and so they bolster their own power. Dolma and Nomi, the main characters of the novels considered here, both resist this power through their own subjective approaches to knowledge.

Keywords: *Knowledge, resisting authority, scholarship, emotion, identity.*

Knowledge and information are very similar concepts, but what nuances in meaning hide in that small space between them? One answer is power. Knowledge connotes importance and necessitates correctness, and it is dominant groups or institutions who decide what information is important and correct so that it may be termed knowledge. But something else lives in that gap, too: emotion. It is possible to feel that some piece of information or some idea is right or wrong without logic, without it having been legitimated by power.

This second idea is very present in Tsering Yangzom Lama's novel *We Measure the Earth With Our Bodies*. So is its tension with the definition of knowledge based on power. Dolma, a young woman of the Tibetan diaspora studying in Canada, struggles with this tension as she tries to reconcile her ardent wish to be a scholar of Tibetan history with the very real impact that history is having on her identity, emotional and otherwise. How does the locus of a subject affect how they approach academic study, and what roles do authorities and the subject's own feelings play in the matter of *legitimating* that study?

These questions are just as fruitful to consider from the different perspective of Nomi, a teenager in a Mennonite community who is the meta-author of Miriam Toews's *A Complicated Kindness*. Nomi finds her community and its authorized Biblical versions of the truth so absurd that she often treats her world as a subject of study removed from herself, in a rebellious attempt to form her own identity apart from it. However, she cannot escape the reality that she has grown up immersed in and shaped by Mennonite culture. In different contexts, Dolma's and Nomi's stories both deal with issues concerning their individual approach to knowledge and resisting the authorities who disapprove of it. Is it more important to know or to feel what is right?

Dolma's and Nomi's stories both take place in Canada, a settler country in which the hegemonic culture has for centuries been Western. Throughout that history, the Western authorities—be they governmental, academic, or religious—have made efforts to displace value systems they felt were *wrong*, in both the factual and moral senses of the word. In his postcolonial work *Orientalism*, one of the points Edward Said seeks to problematize is the restrictive Western view of academic knowledge; namely, that if it is not in every way *objective*, it is problematic. "The determining impingement on most knowledge produced in the contemporary West (and here I speak mainly about the United States) is that it be nonpolitical, that is, scholarly, academic, impartial, above partisan or small-minded doctrinal belief" (Said, 1978, p. 17-18). On the surface, these restrictions seem perfectly logical, as they are intended to mitigate bias which may distort true facts. That is precisely why it is so difficult to argue for a different perspective, and it is this difficulty that Lama's protagonist Dolma encounters in many of her interactions with Western academics.

Said (1978) acknowledges that "one can have no quarrel with such an ambition in theory, perhaps, but in practice the reality is much more problematic" (p. 18). Knowledge should ideally be objective, but the reality Said identifies is that each scholar's brain producing even supposedly 'nonpolitical' knowledge is nonethe-

less a living being that holds its own values, political and otherwise, consciously and not. But the Western academia Said describes, and which Dolma experiences, denies this. The locus of a subject wishing to study and produce knowledge concerning an object must be emotionally removed from that object to avoid bias and be properly academic. For Dolma, this is impossible, and this is where her values start to come into conflict. She feels that it does the domain of Tibetan Studies and Tibetans as a people an injustice to maintain that it should be treated with unfeeling objectivity, as the Chinese occupation of her homeland still affects her and each Tibetan profoundly. At the same time, she feels just as strongly that she should play her part to ensure that Western academia, which requires this absolute neutrality that she cannot give, pays greater attention to Tibet and its people.

Nomi's experience with the Mennonite Christian Church is also one of disagreeing as an individual with an institution much more powerful than herself, which claims to be the arbiter of knowledge. In Nomi's case, the Church claims knowledge is rooted in faith, not science. The criteria of objectivity here are different. Nomi's community treats any information which has been *determined to have come from God* as objective truth, and by contrast, all that which is human is subjective. As one teenage girl who feels that the Mennonite way of life is wrong for her, Nomi is seen by many around her as a wrong, 'misguided' person who must be brought to enlightenment with the help of the Church, as it is that institution which determines which information is knowledge from God. In that sense, her experience is in some ways like Dolma's, who is seen as a misguided academic due to her 'too-political' opinions.

Neither of them can be permitted to guide themselves to knowledge. Their efforts to learn and criticize both must overcome the obstacle of a powerful authority telling them their individualized method and outlook is wrong, because it disagrees with what they have determined is the 'objective' truth.

As an individual, it is difficult to remain confident when opposing an established authority. Chicana-American scholar Gloria Anzaldúa (1987) speaks from experience when she writes, "The ambivalence from the clash of voices results in mental and emotional states of perplexity. Internal strife results in insecurity and indecisiveness" (p. 78). Though Anzaldúa's context is not the same as that of Nomi or Dolma, a similar internal strife resulting from the clash of their voices with those of authorities can be seen throughout each of their stories, such as when Nomi struggles to leave her community despite her constantly-professed dislike of it, and Dolma wrestles with what to do about her community's precious *ku*, a small statue of a seated man which has tremendous religious significance in her Tibetan Buddhist culture, when she finds it in the hands of rich (white) collectors.

Shortly after having seen the *ku* for the first time, Dolma engages in a discussion with Professor Horowitz, an academic who studies Tibetan culture, and implores him not to remain blinded by his Western insistence on detachment in academia. She tells him he must realize that his scholarship affects the world beyond academia, because "to the academy, to the wider public outside my community, you are seen as the objective, enlightened arbiter of truth" (Lama, 2022, p. 116). The use of the word 'enlightened,' with its connotations of unquestionable religious authority, is very deliberate. It connotes having knowledge that *must* be right—morally and factually—because it has been granted by a higher source, be that God or, in this case, some perfectly objective ideal Truth. Horowitz is of the sincere opinion that academia can only pursue its quest for knowledge and truth correctly by detaching itself, politically and emotionally, from that which it studies. This is because politics and emotion are subjective, and subjectivity is the antithesis of Truth—in the Western view, at least.

However, since the Western model sees itself as inherently objective, it does not acknowledge that its own way of seeing things is a subjective one as well. It believes that it has discovered the one (objectively) correct way of conducting academia. According to Said (1978), this Western idea of having discovered the 'one correct way' does not only apply to academia, but many other facets of life: "It can be argued that the major component in European culture is precisely what made that culture hegemonic both in and outside Europe: the idea of European identity as a superior one in comparison with all the non-European peoples and cultures" (p. 15).

But Western scholars feel that they can bat away this accusation of a superiority complex, because there can be no superiority or inferiority when it comes to objective fact: it is either true or not. And the idea of subjectivity being anathema to the pursuit of truth is seen as indisputable fact. Horowitz responds to Dolma's plea in a deliberately reasonable tone, and says, "We're not some unified group of monsters out to oppress you. We're also not freedom fighters. We're scholars" (Lama, 2022, p. 116). The way in which Horowitz logically frames these statements implies that being a scholar automatically excludes one from both the category of oppressor and that of freedom fighter. Through this framing, he cleverly presents what is really an opinion as though it is fact. By doing this, he is further reiterating his own position that all proper scholars like him must be objective and logical in their pursuit of truth. Even in the face of his professorial authority, Dolma maintains her unorthodox opinion that it is wrong for academia to treat the subject of Tibet as a neutral field of study. However, as this is an assertion based on feeling, that precludes it from being an acceptable argument by Western standards of academia.

Nomi also attempts to assert her nonconforming identity and way of being against the larger authorities in her life, both academic and religious. Nomi inhabits an in-between space when it comes to studying from objectivity or subjectivity: she enjoys observing and critiquing what she perceives to be the absurdities of her Mennonite community, even as she continues to live within it. For example, she writes that "Golf was another one [of the few games Mennonites were allowed to play] because it consisted of using a rod to hit something much, much smaller than yourself and a lot of men in this town enjoyed that sort of thing" (Toews, 2018, p. 39). Nomi takes two things she has observed—her community's restriction of games, and abusers—and deftly connects them in a simple sentence ostensibly about golf. This kind of observational study tinged with humor appears to be Nomi's way of removing herself from a place in which she feels uncomfortable while being unable, physically or emotionally, to leave the Mennonite community of East Village.

She places an emphasis on living in and examining the present and constantly providing commentary on it. In the Mennonite life, as Nomi sees it, there is a focus on the past and the future; in her words, "There's not a lot of interest in the present tense here" (Toews, 2018, p. 49). Members of her community are meant to spend their time contemplating the meaning of the past as recorded in the Bible and preparing for their future life after death. By contrast, Nomi, as meta-author, tells her entire story in the present tense. Her intense focus on examining the present acts as a form of rebellion: to remove herself from the areas of life—the past and the future—governed by an authority she experiences as oppressive, she makes her escape temporally, not spatially. She does this, for example, with her assignments. "I've got a problem with endings" (Toews, 2018, p. 1), she says. Nomi does not want to place that which she creates in the past by calling it finished, because that would be putting it in one of those domains—the past—which lives within the control of authorities outside herself: the church and her teacher, Mr. Quiring. Perhaps the reason she has a "problem" with endings is that she wants to keep her work in a perpetual present, the way she herself tries to live, so that it remains under *her* control. Her creative work is an important part of her identity, and she wants to keep it hers.

Unlike Nomi, who feels trapped in her hometown, Dolma exists far from her homeland, and so connecting to her history is incredibly important to her as she tries to shape her identity in diaspora. Dolma values and loves her people's history, but in studying it experiences a fracturing of her identity—even as she is asserting it in her choice of field—since to legitimize her history in the West she must remain academically impersonal about it. This goes against how Tibetan culture has always treated the past: as something living to interact with. The ku, which is so central to the story, is not merely art or a historical artifact, but contains and preserves the deeply moving stories of all the struggling Tibetans who have held it over the centuries. "[The *ku*] brings a message that is really a question: *Does your sorrow look like mine? Do you feel all alone?* [...] *I will reflect your torment back to you. And you will know, finally, that you are not alone"* (Lama, 2022, p. 195-196). Dolma struggles to adapt this deep Tibetan emotional appreciation of fragments of the past like the *ku*, which is so important to her people and her identity, to the academic life in the West she also yearns for.

Conversely, Nomi wants to shape herself in opposition to her history, because she is so immersed in it and feels trapped by her old-fashioned town, which doesn't seem to want to move into the present. Nomi uses academia not as a means toward acceptance but as a tool to rebel. Unlike Dolma, she does not (need to) care about being legitimated by having others view her academic work favourably. In fact, not doing so is part of her journey towards identity: she is asserting independence in a community that prescribes conformity.

Authorities often consider themselves sole authors of the truth. Both Nomi and Dolma are told that questions (in academia and in life) have one correct answer, determined by an authority much larger than themselves which is meant to be—literally or figuratively—enlightened, and to know what is objectively true. Dolma is told the best knowledge comes from detached objectivity, and Nomi is told it comes from faith. They both exist partially within and outside the authority of the organizations telling them so, and this in-between position allows them to have a different perspective on knowledge from the authorities trying to decide it for them. Nomi expresses her rebellious identity through her schoolwork, despite it often being rejected on the grounds that she has put too much of her personal humor in it. Dolma cannot embrace the kind of detached study aiming for capital-t Truth, much as she may also wish to be accepted by Western academia. It often seems that the two young women oppose the idea of a single correct answer that is necessarily in someone's control: Dolma out of a deep-rooted care for her people, and Nomi as a means of asserting her freedom. ■

Anzaldúa, G. (1987). *Borderlands/la frontera: The new mestiza.* Aunt Lute Books.

Lama, T. Y. (2022). *We measure the earth with our bodies*. McClelland & Stewart.

Said, E. (1978). *Orientalism*. Routledge & Kegan Paul Ltd.

Toews, M. (2018). *A complicated kindness.* Faber & Faber.

 https://doi.org/10.70578/ICVY1745

THE ROLE OF INTUITIVE ANGER IN PUBLIC PUNITIVENESS: AN INVESTIGATION INTO THE INFLUENCE OF ANGER ON PEOPLE'S REACTIONS TO CRIME

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Nadezhda (Nadia) Velchovska is currently completing a BA Honours in Psychology, with a minor in Multidisciplinary Studies in Science. This work was written for SCOL-290/Directed and Independent Study under Dr. Carolyn Côté-Lussier, an Assistant Professor at the Urbanization Culture and Society Center of the Institut National de la Recherche Scientifique (INRS).

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ABSTRACT

Anger is a fundamental human emotion characterized by opposition, impatience, and dissatisfaction. It is usually triggered during particular events and could result in a variety of physiological and behavioral reactions (DeCelles et al., 2020). This study focused on the role of anger in people's reactions to crime. Specifically , it investigated intuitive anger, a quick and automatic negative emotional response that opposes principles of punishment but still contributes to punitiveness. To explore the influence of intuitive anger on the tendency to impose punishment or penalties on others, this study used facial electromyography (fEMG) and collected data from students at McGill University in Canada (N= 40). The present study's repeated-measures experimental design would enable testing of the hypothesis that when making punitive decisions for alleged «stereotypical criminals,» individuals will exhibit greater responses of intuitive anger. It was anticipated that the display of images depicting stereotypical criminals would result in a substantial rise in instinctive anger response compared to images of atypical criminals. This is because the former are often perceived as lacking warmth (meaning, a lack of friendliness, kindness, and approachability) (Fiske et al., 2002). Therefore, this approach suggests potential variations in emotional responses based on the type of image presented.

Keywords: *Crime, Emotional Responses, Public Punitiveness, Anger, Facial Electromyography (fEMG).*

Anger is a proactive emotion that is generally aroused in situations or events that are seen to be opposing one's interests (e.g., dishonesty, unfairness) (Canton, 2015). Anger has been recognized as a driving force in the context of supporting harsher punishment of crime (Hartnagel & Templeton, 2012) and expressing more punitive reactions to specific criminal activities (Gault & Sabini, 2000; Lerner et al., 1998). Punishment and punitiveness refer to a range of attitudes and behaviors, including the desire to exclude or harm others (Carlsmith et al., 2008). These punitive tendencies are, therefore, similar to those of aggression, and are often motivated by anger in response to perceived wrongdoing (Carlsmith & Darley, 2008).

According to the Behaviors from Intergroup Affect and Stereotypes (BIAS) framework, emotional reactions toward social groups are largely influenced by two fundamental dimensions of social perception: warmth, which refers to perceived friendliness, kindness, and approachability; and competence, which refers to perceived capability, skill, and effectiveness (Abele et al., 2008; Bye & Herrebrøden, 2018; Conway et al., 1996; Fiske et al., 2007; Judd et al., 2005; Wiggins, 1979). Social groups often perceived as lacking warmth and competence, such as the homeless and impoverished, typically evoke negative emotions such as contempt, anger, and disgust (Fiske et al., 2002). According to Ufkes et al. (2012), when a group is perceived as lacking warmth, anger is often associated with it, in part because it is viewed as ill-intentioned. Based on the BIAS framework, previous studies have shown that individuals labeled as «criminals» are generally perceived as lacking both warmth and competence. However, they are often viewed as more competent than they are warm (Côté-Lussier, 2016). According to Hall et al. (2015), sometimes being identified by race can negatively affect how warmly someone is perceived. For instance, African American individuals are often perceived as less warm and are more likely to be labeled as «criminals» when compared to White individuals. Stereotypical perceptions of criminals often include characteristics such as being homeless, poor, aggressive, and untrustworthy, in addition to racial factors (Hurwitz & Peffley, 1997). So, when people hold these stereotypical views and see «criminals» as cold or lacking in warmth, they tend to express more anger towards them (Côté-Lussier, 2016).

Facial electromyography (fEMG) is a technique that measures the electrical activity in specific muscle regions of the face. As muscle activity in facial expressions is often not visible, fEMG is a valuable tool for understanding implicit responses and behaviors (Mitchell et al., 2015). fEMG has been used in several studies to demonstrate specific facial muscle activity in response to different affective responses, implying that facial muscle responses are a common aspect of emotional reactions (Jakesch et al., 2017; Kelati et al., 2022; Spapé et al., 2013). By using fEMG, researchers can assess

participants' emotional states without their knowledge, avoiding the potential bias that comes with asking them to report their feelings (Lindell et al., 2022). The basic principle of fEMG is that when a muscle contracts, it generates electrical activity that can be detected on the skin's surface, known as the electromyographic signal (Huang et al., 2004). The zygomaticus major muscle is the muscle expanding the lips responsible for smiling, and its electrical activity is thought to indicate a positive emotional reaction (Ziebell et al., 2020). Meanwhile, the corrugator supercilii muscle is activated when the brows are lowered in response to emotions such as fear, anger, and sadness. It is associated with negative emotions and physical, mental, and cognitive effort (Lindell et al., 2022). The signals obtained from electromyography can be used to study emotions by measuring the muscle activity related to facial expressions, which is in line with the idea that our bodily experiences and movements are an integral part of our cognitive processes (Niedenthal, 2007).

The objective of this suggested study would be to investigate whether the feeling of anger contributes to decision-making related to punishment. Data gathering involved showing pictures of individuals who had been convicted of a crime and asking participants to quickly decide on their punishments. Such a design would allow testing the hypothesis that individuals perceived as stereotypical criminals, who are seen as cold and unapproachable, elicit a stronger emotional anger response in individuals (as measured by fEMG) and lead to greater punitiveness, compared to atypical criminals who are perceived as warmer and more approachable. This suggested study aims to replicate the research conducted by Côté-Lussier and David (2022), which was the first to provide empirical evidence of intuitive anger in relation to punishment decision-making. In order to enhance the quality of the results, several modifications are suggested throughout this article to be implemented in an eventual replication study. These included extending the intertrial delay to mitigate potential emotional carryover effects, prolonging the display time to increase the likelihood of eliciting stronger emotional reactions, and augmenting the sample size to improve the statistical power for detecting effects . The purpose of this replication study would be to further understand how intuitive anger influences punitive decisions, which has significant implications for addressing potential biases in the justice system. Understanding these emotional responses is crucial for developing fairer and more equitable judicial processes.

Methods

Participants

The data acquisition of our suggested study has already been completed. The sample we used consisted of 40 participants from McGill University, aged between 18 and 25 years (M = 21.3, SD = 1.8). Participants were recruited through a research participation system that offered course credits in exchange for their voluntary participation in studies conducted at the university. This study investigated individuals' fast emotional reactions and decision-making processes when punishing others. Technical issues resulted in a loss of data for five participants, leaving a final sample of 35 participants consisting of both males (N = 14) and females (N = 21) from diverse backgrounds. The present study received ethics approval from INRS and McGill.

Apparatus

The computer standardized task was presented on a 14-inch DELL 2009 monitor positioned at a distance of 60 cm from the participant. The participants used the computer system to complete the standardized task, which was programmed using Python, and a questionnaire about their general attitudes toward crime and society and other sociodemographic measures.

Multiple physiological signals were acquired from the participants to investigate their emotional responses during the experimental task. Facial electromyography (EMG) signals were collected using a BIOPAC MP150 data acquisition system. Five Ag-AgCl surface electrodes were placed over the zygomaticus major and corrugator supercilii muscles on the left side of the face, along with electrodes on the forehead. In addition, two skin conductance response (SCR) electrodes were attached to the participants' middle and index fingers to record physiological changes in electrical conductance. To ensure high-quality signals, the EMG signals were bandpass filtered between 10 Hz and 500 Hz and sampled at a rate of 1,000 Hz using the BIOPAC MP150 system. Simultaneously, BIONOMADIX, a biopotential sensor designed to be worn on the body and record physiological signals, was worn by the participants on their non-dominant arm during the experiment. The sensor allowed for the attachment of wires to the electrolytes during the experiment.

Data acquisition and analysis were conducted using an iMac 2019 computer equipped with a 24-inch anti-glare screen and MacOS operating system. A wireless mouse and keyboard were connected via Bluetooth for ease of use. The computer was primarily used for AcqKnowledge, a data acquisition and analysis software that was an integral part of BIOPAC MP 150. The software enabled us to collect, record, and analyze the psychophysiological data with ease and accuracy.

Procedure

The protocol for our suggested study replication has already been carried and went as followed: the individuals who took part in this study were first welcomed into the lab and seated on a comfortable chair in front of the computer. They were informed that they would be presented with a task in which they would be shown photographs of people who had been convicted of one or multiple criminal offenses and were required to determine the appropriate sentencing, with options of a prison or non-prison sentence. The photographs were of male criminals (N= 52), and the decision had to be made as quickly as possible based on their gut reaction. The participants were not given detailed information about the specific crimes associated with each image. Instead, they were presented with a general summary of the categories of offenses that were committed: minor assault, property theft, tax evasion, drug dealing, vandalism, drunk driving, fraud, or burglary.

If a prison sentence was chosen, the length of the sentence was based on the customary duration for the specific offense committed, ranging from two months to five years. Conversely, if a non-prison sentence was chosen, the individual would have received a typical non-prison sentence for the offense, such as probation or community service. These sentences were established according to the actual sentencing guidelines for the identified offenses.

Before beginning this study, participants were required to sign a consent form. Next, the researcher used an alcohol wipe to clean the areas of the participant's face where the 5 Ag-AgC electrolytes would be attached, namely 2 on the corrugator supercilii, 2 on the zygomaticus major muscle areas on the left side, and 1 in the middle of the forehead. The BIONOMADIX device was then attached to the participant's arm, and wires were connected from the device to the electrodes. Additionally, conductive gel was applied to the 2 SCR electrodes, which were then placed on the participant's index and middle fingers, and wires were attached from the BIOPAC station to the SCR electrodes. After these preparations, the participant were left alone to complete a practice task, which involved identifying men and women, to familiarize them with the set-up and procedure. Following this task, the participant completed the main computerized task. Finally, participants filled out a survey that included sociodemographic measures and their general attitudes toward crime and society. Before concluding the present study, participants signed a debrief form.

Data analysis

This suggested study would aim to analyze facial EMG data for the emotions of anger and happiness over time and in relation to picture type. Like the previous study by Côté-Lussier and David (2022), our analysis would use regression modeling, to test the primary hypotheses, and since it would involve multiple punishment decisions from participants for the same pictures in an experimental design, the models would take into account the within-participant and within-picture clustering using a mixed effects approach (Côté-Lussier & David, 2022). The models in this study would use a crossed-level approach to account for both participant-level and picture-level clustering of data simultaneously. This approach would correct standard errors and would be necessary because the data has a cross-classified structure.

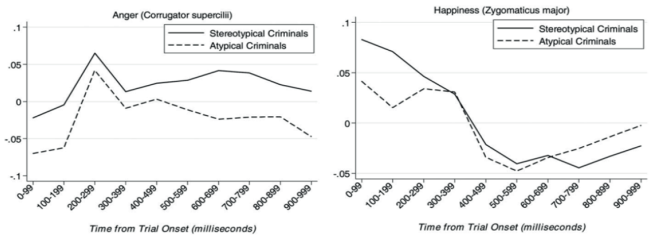
First, this study would use multiple linear regression models to analyze the impact of picture type (stereotypical vs. atypical) on emotional responses of anger and happiness. Additionally, a binary logistic regression model would be used to evaluate the impact of picture type and anger on the likelihood of a prison sentence being given versus a non-prison sentence (Côté-Lussier & David, 2022).

Then, a statistical analysis method called crossed multilevel survival analysis would be used to examine the effect of picture type and anger on the time it takes for participants to make a decision (either a prison or non-prison decision). This method would take into account both the decision type and the speed at which the decision was made following the presentation of a picture. The analysis would use a competing event approach, meaning that participants who made a non-prison decision would no longer be considered at risk of making a prison decision, and vice versa. The length of observation would not be restricted, and a baseline hazard would be selected using the Akaike Information Criterion (AIC) to determine the shape of the distribution of punitive decisions. The log-logistic distribution would be found to offer the best fit for the data, indicating that the event rate initially increases but then decreases over time (Côté-Lussier & David, 2022).

Results

As this study would be a replication, we would anticipate that the findings would closely resemble those of the original study. Based on the previous analysis, we would expect to observe an initial startle response occurring between 0-300ms, followed by pronounced emotional responses at 600-800ms for both anger (corrugator supercilii) and happiness (zygomaticus major) (refer to Figure 4). We would anticipate that emotional activation would persist throughout the full observation period of 1400ms, in line with the results reported by Côté-Lussier and David (2022).

Figure 4. *Average standardized facial EMG score over 1000 ms (Côté-Lussier & David, 2022)*



Note: This figure shows the average standardized facial EMG scores for Anger (Corrugator supercilii) and Happiness (Zygomaticus major) over a 1000 ms period for stereotypical and atypical criminals. From «Intuitive Anger in the Context of Crime and Punishment: An Exploratory Study,» by M. Côté-Lussier and J. P. David, 2022, *Journal of Experimental Social Psychology*, 89, 234-250. https://doi.org/10.1016/j.jesp.2022.104010. Copyright 2022 by Elsevier.

We would expect the results to show evidence of differences in emotional responses based on the type of picture shown. Specifically, we would expect that viewing stereotypical images would trigger a greater initial surge of anger, followed by a peak in anger between 600-800ms (as depicted in Figure 4), whereas viewing atypical images would elicit a more gradual decline in anger. Furthermore, we would anticipate that atypical images would elicit slightly higher levels of happiness around 700-800ms compared to stereotypical images (as shown in Figure 4).

In this suggested study, it is hypothesized that individuals would have greater intuitive angry responses when making punitive decisions for stereotypical criminals compared to atypical criminals. Therefore, the results would have to demonstrate that images of stereotypical criminals elicit a statistically significant increase in intuitive angry responses, while no significant differences would be expected in happy responses. If these patterns are observed, they would provide support for the hypothesis that individuals may experience greater intuitive anger in response to stereotypical criminals (Côté-Lussier & David, 2022).

Discussion

This proposed study aims to explore whether people feel stronger rapid feelings of anger when making punitive decisions for individuals perceived as "stereotypical criminals" as opposed to "atypical criminals". The data gathering step focused on recording the physiological markers of anger which are triggered when participants were asked to decide on the punishment of individuals depicted in pictures as criminals. Facial electromyography, which measures the activation of the corrugator supercilii muscle responsible for frowning, was used to track anger levels. The results of this study are anticipated to reveal that evidence of changes in anger is most apparent 500 ms after the pictures were presented, with peak responses appearing around the 700 ms mark. These results would be consistent with the notion that emotional activation in response to visual stimuli typically occurs after about 500 ms (Dimberg & Thunberg, 2012).

In this proposed study, it is anticipated that people would experience stronger intuitive anger towards 'stereotypical criminals,' who are perceived as less warm. It is suggested that the study may not find a significant link between picture type and happiness, potentially due to the weaker specificity and crossover signals in the muscles involved in expressing happiness (Côté-Lussier & David, 2022). If the anticipated results align with these expectations, they would provide support for the hypothesis that intuitive anger plays a crucial role in intergroup dynamics and emerges during punitive decision-making (Côté-Lussier & David, 2022).

This study has several strong points, including the use of an advanced statistical analysis and its incorporation of psychophysiological measures to assess emotional responses. The application of such a method is an established and empirically supported approach within the field of psychology, yet is rarely employed in studies investigating reactions to stigmatized or criminalized individuals. Additionally, this study implemented several modifications to optimize the methodology from the previous study by Côté-Lussier and David (2022), including an extended intertrial delay to minimize the potential impact of emotional carryover effects on subsequent trials, and prolonged display time for each picture to increase the likelihood of eliciting stronger and more reliable emotional reactions. Moreover, the present study augmented the sample size, providing greater statistical power and precision for detecting the effects of interest. These modifications reflect this study's commitment to enhancing the validity of its findings and contribute to the broader understanding of emotional responses to criminalized individuals. Exploring intuitive anger and its impact on punitive decisions can reveal the underlying biases that shape judicial processes. This understanding is essential for developing interventions that reduce emotional biases, ensuring more equitable treatment of individuals within the justice system. The insights gained from such a study could future research, exploring other emotional responses and their influence on decision-making in various contexts of criminalization.

Conclusion

The results of this proposed study would be critical for the development of more effective interventions and policies toward a reduction in bias and an increase in fairness in the justice system. Through replication and extension of prior work, it would contribute to a better understanding of how intuitive anger interacts with punitiveness, which is important in not only bridging the gap for more equitable judicial approaches but will also promote a more just society. Addressing the gaps and confirming the results could lead to more effective interventions and a deeper understanding of the emotional dynamics at play in criminalization contexts (Côté-Lussier & David, 2022), while developments in methodology and insights from this work would establish the foundation for future research, providing a more complex and complete understanding of these dynamics. ■

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THE TRANSIENT NATURE OF HYSTERIA: HOW PATRIARCHAL VICTORIAN VALUES FOSTERED ITS EXISTENCE.

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ABSTRACT

Hysteria is an ever-changing illness that has historically been regarded as both a medical and mental disorder. Characterized by a plethora of symptoms such as anxiety, irritability, and grand movements, the disease was particularly diagnosed in females at its peak in the 19th century. Key figures of the 19th century's medical and psychological spheres, such as Jean-Martin Charcot and Sigmund Freud, contributed to the perception of hysteria as a predominantly female disease. Charcot's presentations of the female hysterical body, coupled with the patriarchal values of the Victorian Era, created the perfect environment for hysteria to be viewed in this way. Although once quite prominent, the diagnosis of hysteria ultimately disappeared with its removal from the DSM-III in 1980. Its disappearance and transient nature raise questions about how societal and cultural factors impact the narrative of illnesses. These questions can be approached using Canadian philosopher Ian Hacking's framework for transient mental illnesses. This framework asserts that mental illnesses are transient because they require a specific environment to flourish, often referred to as an "ecological niche". Furthermore, Hacking suggests there are four possible vectors that contribute to the development of these illnesses: 1) the illness and its symptoms must be deemed abnormal, 2) the deviant behaviour of the illness must align with other illnesses, 3) the illness must lie between a cultural polarity, and 4) the illness must provide release. Thus, using the concept of Ian Hacking's framework, hysteria can be viewed as a transient mental illness fostered by the patriarchal values of the Victorian Era and can be examined through each of the four vectors.

Keywords: *Psychology, illness, disorder, hysteria, patriarchy.*

In the 21st century, the term "hysterical" is nothing more than an adjective used to describe an overly emotional and uncontrollable person. However, it has not been too long since the term was pathological in origin. For much of history, being "hysterical" was associated with hysteria- an illness primarily attributed to women and approached from both scientific and demonological perspectives (Tasca et al., 2012). With early descriptions of hysteria dating back to ancient Egypt in the second millennium BC, the disorder has taken various forms as it made its way to its peak in 19th century Paris and Vienna (Tasca et al., 2012; Micale, 1993). First described as a medical disorder in 1880 by neurologist Jean-Martin Charcot, the disease soon became regarded as a psychological disorder at the turn of the 20th century, largely due to the contributions of Sigmund Freud, the father of psychoanalysis (McVean, 2017). Despite the Victorian Era being considered the age of hysteria, the disorder's prominence was short lived (Micale, 1993). By 1980, hysteria was deleted from the Diagnostic and Statistical Manual of Mental Disorders, Third Edition (DSM-III), and its symptoms became characterized as manifestations of dissociative disorders (Tasca et al., 2012). Seemingly, the ever-changing form of this disease is perhaps its only constant, raising questions about how cultural and societal factors can shape the narrative of mental illnesses (Smith-Rosenberg, 1972).

Early descriptions of hysteria date back to 1900 BC, with references to ancient Egyptians. During this time, hysterical disorders were thought to be caused by spontaneous uterus movement in a woman's body (Tasca et al., 2012). The idea of hysteria being due to a wandering uterus held true in ancient Greece, circa 5th century BC. The Greek physician Hippocrates believed that the displaced uterus was caused by stagnant bodily fluids in a woman's body due to a lack of sexual activity, leading to various symptoms such as feelings of anxiety and suffocation, tremors, convulsions, and paralysis (Tasca et al., 2012). It was believed that by engaging in sex and procreation, a woman's canals were widened, cleansing her body, and rendering her immune from hysteria (Tasca et al., 2012). Not only does this idea pathologize female sex organs, but it perpetuates the belief that to be "healthy", a woman must submit herself to her husband, or actively be carrying a child.

Similar ideas floated through ancient Rome, the Middle Ages, and the Modern Age, until hysteria began being more closely associated with the brain as opposed to the uterus in the 18th century (Tasca et al., 2012). However, the disorder was still considered a female

disorder during this time. It was only during the Victorian Age (1837-1901) and the time of Charcot's studies of hysteria in Paris that the disorder began to be diagnosed in men as well (Tasca et al., 2012). Nevertheless, most of the rage surrounding hysteria in 19th century Paris was due to Charcot's presentations of typically female hysterical bodies as subjects of public display during dramatized lectures at the Salpêtière (Stephenson, 2001). Therefore, given the societal and cultural climate of the time, hysteria was always more than just a disease; it was also the way the western world understood women's changing roles, and merely a means of confining women to the domestic sphere (Briggs, 2000).

To understand the fleeting nature of hysteria, the disorder can be examined through Canadian philosopher Ian Hacking's framework for transient mental illnesses. While the framework was initially designed to explain the decline of the 1887 illness known as *pathological fugue* in the early 20th century, it can be equally applied to understand the disappearance of hysteria. Mikkel Borch-Jacobsen's summary of Hacking's work presents the concept that mental illnesses are transient, requiring a facilitating environment for their development. Hacking compares this environment to an "ecological niche," as the transient mental illness interacts, cooperates, and depends on its surroundings to flourish (Hacking, 1998, as cited in Borch-Jacobsen, 1999). Using the concept of Hacking's ecological niche, the inferior social role of women perpetuated by patriarchal Victorian values can be seen as the environment fostering the existence of hysteria. Therefore, the patriarchal roots of 19th century hysteria become evident through a detailed exploration of Hacking's framework and his four defining vectors of a transient mental illness.

When applying the concept of a facilitating environment within the context of 19th century hysteria, it becomes evident that the illness is in fact transient, peaking when Charcot was advancing his research at the Salpêtrière Hospital in Paris (Harrington, 2002). This was a time in which the patriarchal Victorian values infiltrated medicine and psychiatry, providing hysteria with the right "ecological niche" it needed to develop. For example, the prevailing ideology of "separate spheres" emphasized gender roles, keeping women confined to the domestic sphere where they were expected to raise the children, take care of the home, and ultimately remain inferior to their husbands. Indeed, the patriarchal root of hysteria is obvious even with a brief overview of its historical transformation.

Hysteria in Hacking's Vectors

The idea of societal and cultural factors influencing the ability for a mental illness to develop is the main tenet of Hacking's framework for transient mental illnesses. As presented in Borch-Jacobsen's review, mental illnesses can "change from one place and time to another, undergo mutations, disappear and reappear", highlighting the ability for each age and society to produce its own form of the illness (Borch-Jacobsen, 1999, p. 104). According to Hacking, there are four essential vectors that make the viability of a transient mental illness possible, each one representing a different way in which the illness develops and integrates into a society and culture (Hacking, 1998, as cited in Borch-Jacobsen, 1999).

The first vector holds that the illness must be identifiably deviant, meaning that the behaviours associated with the illness are perceived as a deviation from the norm. In the case of hysteria, this usually involved pathologizing "normal" behaviours solely because they did not align with what was expected of women in the 19th century. While the symptoms indicating the onset of a hysterical attack (heart palpitations, feelings of tightness in the throat, vision impairment, trouble breathing, and fainting) are generally worrisome, other symptoms appeared particularly characteristic of a non-conforming woman (Stephenson, 2001). For example, Charcot's "archetypal form of hysteria", often demonstrated with hypnosis, was identified to proceed in four unique stages: 1) tonic rigidity, 2) grand movements, 3) 'attitudes passionelles', and 4) delirium (Goldstein, 1987, as cited in Stephenson, 2001). Of these stages, the 'attitudes passionelles' and delirium stages seem especially typical of what would be considered 'out-of-line' behaviour for a Victorian woman. These behaviours are described as vivid displays of emotions, acrobatic talents of a dramatic actress, and a delirious episode defined by sobbing and laughing, before eventually returning to consciousness (Goldstein, 1987, as cited in Stephenson, 2001). In addition to the symptoms outlined by Charcot, physician George Beard (1839-1883) created a seventy-five-page catalogue of hysterical symptoms. However, this list was still deemed incomplete, demonstrating just how many behaviours were considered "abnormal" for women in the 19th century (Briggs, 2000). In contemporary society, overt displays of strong emotions are not pathologized in the same way they were in the 19th century. While women have not yet been spared the label of "emotional", and perhaps even "hysterical", at least they are no longer the subject of Charcot's theatre of hysteria.

Expanding upon the first vector, the second vector suggests that the deviant behaviour must align with pre-existing classes of illnesses, enabling its placement and recognition within an established taxonomy. In the 19th century, Charcot recognized hysteria as a medical disorder, often resembling neurosis and epilepsy. He believed that hysteria was a genetic neurological disorder, involved with the degeneration of the nervous system (Tasca et al., 2012). However, in 1892, Charcot admitted to not knowing much about the nature of the illness, but only of its manifestations and symptoms (Micale, 1993). Therefore, hysteria began assuming its form by imitating other disorders, leading to a symptomatology that changed over time (Micale, 1993). For example, hysteria in the 1870s centred on neurological somatizations such as paralyses, anaesthesia, and visual and auditory impairments (Micale, 1993). For the rest of the 19th century, hysteria was in the process of branching out into clinical subcategories such as traumatic hysteria and hysterical fever (Micale, 1993). By the 20th century, hysteria had taken the form of a psychological disorder, largely due to Freud's contributions. Unlike Charcot, Freud, with his partner Josef Breuer, developed the idea that hysteria was caused by psychological damage that had been produced through repression or traumatic events (McVean, 2017). Therefore, hysteria fits well within Hacking's second vector, just as it fits well alongside the pre-existing illnesses of its time.

The third vector highlights the need for the illness to fit

within a cultural polarity that deems certain behaviours as positive, and others as negative. For example, in the context of pathological fugue, "running away" lies between the valorized and popularized tourism, and the devalorized vagrancy (Hacking, 1998, as cited in Borch-Jacobsen, 1999). In the case of hysteria, its contradiction or "polarity" is evident between its believed cause and cure. As previously noted, the cause of hysteria was ill-defined, essentially serving as a catch-all diagnosis for women exhibiting unmanageable symptoms (McVean, 2017). However, one prevailing idea for the cause of hysteria was linked to uterine movement or dysfunction, as well as a lack of sexual activity and conception (Tasca et al., 2012). If a woman was uninterested in marriage, motherhood, or sexual activity, she was likely diagnosed hysterical. This is connected to a woman's failure to fulfill the societal role expected of her, highlighting the limited agency allotted to women in the 19th century (Smith-Rosenberg, 1972). In this respect, the cure for hysteria was simply ordering women to get married and have sex. In the past, this was done to allow the uterus to return to its natural position, while restoring the flow of the woman's sexual fluids. In contrast, according to Freud in the late 19th and early 20th century, the purpose was for a woman to potentially recover her lost penis by marrying a male or giving birth to one, following her 'Oedipal moment of recognition' (McVean, 2017). Under this framework, it is believed that a woman's hysterical behaviours are thus driven by her envy towards man. This idea, commonly referred to as Freud's "penis envy theory", further depicts women as nothing if not inferior to men. Despite the cure being centred around sex, gendered stereotypes still held the idea that a woman should be "submissive, even-tempered, and sexually inhibited" (McVean, 2017, p. 1). Therefore, if a woman was openly sexual or had premarital sex, she did not fit the standards of a respectable Victorian woman. The contradiction between cause and cure is thus an evident demonstration of how female sexuality was conveniently manipulated to satisfy the men, while keeping women constrained to their inferior role. In the context of Hacking's vector, 19th century hysteria thus lies between a cultural polarity that deems female sexuality as positive when at the service of one's husband, and negative if at the woman's own discretion.

Finally, the fourth vector states that for a mental illness to be considered transient, it must provide some form of release. In the words of Freud, this release would be the "primary gain from illness" (Borch-Jacobsen, 1999). Essentially, the "release" can be viewed as some coping mechanism used by those inflicted with an illness to express their emotions and cope with their internal struggles. An obvious struggle for most women in the 19th century was centred around accepting their social role. Despite females being expected to be submissive, gentle, and affectionate caregivers, their reality was not always consistent with the ideals of female socialization (Smith-Rosenberg, 1972). For example, what was considered the ideal woman was not what was expected of the ideal mother. The societal ideal for women was characterized by expectations of softness, dependence, and compliance, whereas the ideal for mothers emphasized strength, protectiveness, and self-sufficiency (Smith-Rosenberg, 1972). Women were often not prepared to assume the responsibilities associated with motherhood, marriage, and maturation, thus leading to complaints of loneliness and depression (Smith-Rosenberg, 1972). This being considered, it is no coincidence that there was a high incidence of hysteria among women and mothers who found themselves overwhelmed by the demands of their societal roles. It is for this reason that some scholars would consider hysteria to be a diagnostic display of women's exclusion from the public sphere, or as a warning of what could arise if a woman were to engage in "unfeminine" actions (Briggs, 2000). Therefore, in the context of this vector, the "primary gain" from hysteria manifests as women overtly expressing their dissatisfaction with their assigned social roles.

While Hacking limited his work to these four vectors, he did recognize the possibility of others, as noted by Borch-Jacobsen (1999) in his review. Mentioned only in passing by Hacking, a fifth vector was introduced by Borch-Jacobsen: the clause of irresponsibility. In other words, the ill person must not be responsible for his behaviours, and the "fault" must be attributed to something else (Borch-Jacobsen, 1999). Therefore, it can be argued that by examining the history of 19th century hysteria through Hacking's framework, it is revealed that a female's "hysterical" emotional outburst is in fact attributable to something else- the patriarchally rooted societal demands placed on Victorian women.

Conclusion

To conclude, a careful review of hysteria throughout the 19th century reveals that the illness is a product of its social and cultural surroundings. Applying Hacking's framework of transient mental illnesses to hysteria makes it evident that patriarchal Victorian values have significantly influenced the development of the illness. Behaviours associated with female hysteria, such as overt emotional displays or denying the sexual advances of their husbands, were not in line with the expectations of a Victorian woman. This non-conformity meets the requirement of Hacking's first vector, which holds that the illness and its symptoms must deviate from the norm. Furthermore, the symptomatology of hysteria often mirrored other prevalent illnesses of the time, satisfying Hacking's second vector which asserts that the deviant behaviour of a transient mental illness must align with pre-existing illnesses. Additionally, hysteria meets the criteria of Hacking's third vector by lying between a cultural polarity that only deems female sexuality as positive if it is at the disposal of the woman's husband. Finally, hysteria fulfills Hacking's requirements of a transient mental illness by satisfying his fourth vector which states that the disease must provide some form of release. In the case of hysteria, the "primary gain" of the illness can be regarded as a woman expressing her discontent with what society expects of her. Therefore, the exploration of hysteria's transient nature demonstrates that the illness is not merely a medical condition, but a manifestation of the deeply rooted patriarchal values that dictated women's lives in the 19th century. ■

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PARTICIPATION IN EXTRACURRICULAR ACTIVITIES AND ITS EFFECT ON SELF-ESTEEM AMONG YOUTH IN CANADA

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ABSTRACT

This paper explores how participation in extracurricular activities impacts self-esteem among youth and whether there are any other independent variables that may influence this relationship. I will answer the following research questions: How does participation in extracurricular activities affect a student's self-rated self-esteem in Canada, between the ages of 10 and 15? Also, how do other independent variables, including type of activity, age, sex/gender, academic success and engagement, and perceived peer acceptance interact with participation in extracurricular activities to influence self-esteem?

Keywords: *Self-esteem, extracurricular activities, youth, quantitative, multivariate analysis.*

Past research suggests that there is a link between participation in extra-curricular activities and self-esteem among youth (Gadbois & Bowker, 2007; Eccles & Barber, 1999). However, it is difficult to determine the causality of this relationship because of the presence of other independent variables; namely, age, sex, type of activity, perceived academic success, and perceived peer acceptance (Daniels & Leaper, 2006; Eccles & Barber, 1999; Gadbois & Bowker, 2007; Kantzas & Venetsanou, 2020; Kort-Butler & Hagewen, 2011; Mahoney & Vest, 2012; Mak & Fancourt, 2019; Wagnsson et al., 2014). Using data from a 1998-1999 survey by the National Longitudinal Survey of Children and Youth, I sought to answer two questions. First, how does participation in extracurricular activities affect the self-rated self-esteem of students between the ages of 10 and 15 in Canada? Second, how do other independent variables, including type of activity, age, sex/ gender, academic success and engagement, and perceived peer acceptance interact with participation in extracurricular activities to influence self-esteem?

A bivariate analysis revealed a significant relationship between self-esteem and each of the independent variables, as well as between the type of activity chosen and one's age, sex, and perceived peer acceptance. In a multiple linear regression, the independent variables of age, sex/gender, and perceived peer acceptance were the most influential factors for both self-reported self-esteem among youth and their rates of participation in extracurricular activities—namely, younger boys with high perceived peer acceptance had greater self-esteem than older youth, girls, and those with low perceived peer acceptance (figure 23). Lastly, younger boys with higher peer acceptance were more likely to be involved in independent and team sports, whereas younger girls were more likely to participate in non-athletic activities (figure 24, 25, 26).

Literature Review

Past research on the effects of extracurricular activity participation and self-esteem in youth has produced contradicting discourses. Some researchers have found a positive link (Gadbois & Bowker, 2007; Eccles & Barber, 1999), while others demonstrated a weak or inverse relationship between the two (Wagnsson et al., 2014). Additionally, some studies have highlighted the importance of other variables which make causality difficult to establish. These variables include the type of activity, age, sex/gender, academic success and engagement and perceived peer acceptance (ex. Daniels & Leaper, 2006; Gadbois & Bowker, 2007; Kort-Butler & Hagewen, 2011; Wagnsson et al., 2014).

SELF-ESTEEM. Researchers have found evidence that self-esteem is closely linked to self-concept and an individual's optimism and willingness to try new things (Gadbois & Bowker, 2007). Kort-Butler and Hagewan (2011) state that "self-esteem buffers emotional consequences of stressors and significantly reduces psychological symptoms" (p. 569). Thus, if we can establish ways to improve self-esteem, individuals will also have increased overall well- being and happiness, higher life satisfaction and be more resilient to stress (Mak & Fancourt, 2019; Wagnsson, Lindwall, & Gustafsson, 2014).

TYPE OF ACTIVITY: INDIVIDUAL SPORT/TEAM SPORT. Much of the current research has focused on the relationship between organized sports and self-esteem. Kantzas and Venetsanou (2020) found that participation in physical activity, whether it is an individual sport, team sport, or dance, positively affects children's self-perception and social wellness. Gadbois and Bowker (2007) add that athletic participation is associated with physical self-esteem and greater body satisfaction. However, inverse, and negative relationships between sport participation and self-esteem have also been reported (Wagnsson et al, 2014).

TYPE OF ACTIVITY: NON-ATHLETIC. Researchers have found a positive correlation between non-athletic activities such as art, student government, volunteering, and music and self- esteem (Mak & Fancourt, 2019). Art creation instills a sense of pride in children and allows them to create bonds with fellow artists in their classes (Mak & Fancourt, 2019). Researchers found that young people who were only involved in non-athletic clubs achieved higher self-esteem than those who were involved in sport alone (Kort-Butler & Hagewen, 2011).

AGE. Researchers agree that "self-esteem destabilizes during adolescence, such that there is a drop in self-esteem in early adolescence and a recovery between mid- and late- adolescence" due to maturity and the stabilization of their self-concept (Kort-Butler & Hagewen, 2011, p.569). Self-concept related to sports and school has been found to stabilize during mid-to late- adolescence, which is relevant because sport participation in adolescents tends to be at its highest between the ages of 13-15 and lowest between the ages of 16-18 (Kort-Butler & Hagewen, 2011; Wagnsson et al., 2014).

SEX/GENDER. Researchers highlight how sport is gendered, and they explain how "peer groups tend to enforce societal gender roles," which can make it difficult for girls to engage in traditionally "masculine" activities, thus lowering their self-esteem (Daniels & Leaper, 2006; Kort-Butler & Hagewen, 2011).

ACADEMIC SUCCESS/ PEER ACCEPTANCE. Academic success and peer acceptance have been positively linked to self-esteem among youth (Daniels & Leaper, 2006; Mak & Fancourt, 2019; Gadbois & Bowker, 2007; Kantzas & Venetsanou, 2020; Kort-Butler & Hagewen, 2011).

The literature shows that researchers have yet to determine the direction of the relationship between participation in extracurricular activities and self-esteem among youth, largely due to the effects of other independent variables (Gadbois & Bowker, 2007). Thus, in this paper, I will investigate the relationship between participation in extracurricular activities and its impact on self-esteem, as well as measure the influence of the type of activity, age, sex/gender, academic success and engagement, and perceived peer acceptance on self-rated self-esteem among youth.

Methods

Data/Sample

I will use data from the National Longitudinal Survey of Children and Youth (NLSCY) to conduct my research. The NLSCY is a long-term study conducted in partnership with Human Resources Development Canada and Statistics Canada. The main goals of this ongoing study are to monitor the development of Canadian children and to "determine the prevalence of various risk and protective factors for children and youth" (Statistics Canada [user guide], 1999, p. 2). By understanding the various factors and life events that Canadian youth experience, this survey equips policymakers to become more knowledgeable and ready to help future children (Statistics Canada [user guide], 1999, p. 2).

The NLSCY is designed to include a representative sample of Canadian youth, from birth into adulthood. However, for the purpose of this paper, I will focus on the cross-sectional data that was released in its third cycle. The cross-sectional data includes a sample of 38,035 children between the ages of 10 and 15 and was conducted by means of a survey between October 1998 and June 1999 (Statistics Canada [user guide], 1999, p. 1 & 5). 5,539 respondents answered questions related to my research topic, and all variables and analyses were weighted to allow for generalizability. This dataset is the most relevant for my research because it includes various questions on self-confidence and self-esteem among youth, as well as questions about participation in sports and non-athletic activities.

At first, I wanted my research to focus on the self-esteem of elementary-level youth (ages 5 to 12); however, that dataset did not exist. In fact, the NLSCY's cross-sectional sample is the only national dataset that includes questions about self-esteem and participation in sports and non-athletic activities among youth. Therefore, due to the absence of alternatives, I made the decision to use this dataset, despite its age.

Measurement/Coding

In order to conduct my research, I recoded a host of variables as either continuous scales or dummy variables. As previously stated, the dependent variable is self-rated self-esteem. To provide a general rating of self-esteem (self_esteem_NEW), a continuous scale combined various questions which related to self-esteem and confidence. These included: CAMCQ01A, "In general, I like the way that I am," CAMCQ01B, "Overall I have a lot to be proud of," CAMCQ01C, "A lot of things about me are good," CAMCQ01D, "When I do something, I do it well," and CAMCcQ1E, "I like the way I look." Each of these variables are measured using a scale, where 1 is false, 2 is mostly false, 3 sometimes false/ sometimes true, 4 is mostly true, and 5 is true. Anything with a score above 6 was not included (6 = not applicable; 7 = don't know; 8 = refusal; 9 = not stated). The use of a scale provided the most representative responses of the sample for this variable.

To measure my independent variable (participation in extracurricular activities), I created a dummy variable (participation_activities_OR) by combining the following variables into a conditional "or" statement: CATCbQ1A, "In the last 12 months, how often have you played sports or done physical activities WITHOUT a coach or instructor (biking, skateboarding etc.)," CATbQ1C, "In the last 12 months, how often have you taken part in dance, gymnastics, karate or other groups or lessons, other than in gym class," CATCbQ1B, "In the last 12 months, how often have you played sports WITH a coach or instructor (swimming lessons, baseball, hockey, etc.)," CATCbQ1D, "In the last 12 months, how often have you taken part in art, drama or music groups, clubs or lessons outside of class," and CATCbQ1E, "In the last 12 months, how often have you taken part in clubs or groups such as Guides or Scouts, 4-H club, community, church or other religious groups?" Each of these variables are measured using a scale that ranges from 1-9 about the participation rates for each of the activities (1 = never; 2 = less than once a week; 3 = 1 to 3 times a week; 4= 4 or more times a week). The NLSCY originally used separate questions for each type of activity but later combined them into categories (ex. Church and scouts in the same variable) (Statistics Canada [user guide], 1999, p. 29).

Since I was looking for whether the respondents participated in extracurricular activities rather than their

rates of participation, I collapsed values 2-4 to create a dummy variable, where 1=yes (less than once a week to 4 or more times a week) and 0=no (never). Once again, anything rated at 6 or higher was not considered for these variables. Since I created a conditional "or" statement for this variable, respondents had to be involved in at least one type of activity to be coded as "yes". This allowed me to determine the distribution of the sample and the frequencies of participation.

As mentioned above, past research suggests that there are other independent variables, such as type of activity, age, sex/ gender, academic success and engagement, and perceived peer acceptance, that influence the relationship between participation in extracurricular activities and self-esteem (Daniels & Leaper, 2006; Mak & Fancourt, 2019; Gadbois & Bowker, 2007; Kantzas & Venetsanou, 2020; Kort-Butler & Hagewen, 2011). I have broken up the following sections to focus on each variable that I will explore in my research.

TYPE OF ACTIVITY: INDEPENDENT SPORT, TEAM SPORT, NON-ATHLETIC ACTIVITY. I explored how the type of activity (independent sport, team sport, or non-athletic activity) influenced both participation in extracurricular activities and self-esteem. The same variables were used as when measuring participation in extracurricular activities. However, rather than making a conditional "or" statement by combining all the variables together, the variables were separated based on the type of activity: CATCbQ1A and CATbQ1C for individual sport (part_independent_sport_NEW); CATCbQ1B for team sport (team_sport); and CATCbQ1D and CATCbQ1E for non-athletic activity (part_non_athletic_sport_NEW). Once again, conditional "or" statements were created for each type of activity and responses were coded as "yes" if the respondent participated in each.

AGE. Originally, I was not planning on exploring age in this research since the data set consists of a close age group (between ages 10 and 15). However, the sample is large and includes an equal distribution of age, so I used the variable CMMCQ01B, where age is grouped into categories (where 1= ages 10-11, 2= ages 12-13, 3= age 14) to consider the effects of age on the dependent variable. No modifications were made to this variable when completing the bivariate analyses. However, three sets of dummy variables were created to use in the multivariate analysis.

SEX/ GENDER. Sex (CMMCQ02) was determined by means of a checklist, where participants could select female (F) or male (M). Interestingly, this variable was operationalized as "gender of child," however, the year of publication of this study leads me to believe that they were referencing the biological sex of the child and not their gender expression. Thus, I will continue to reference this variable as sex/gender in my paper. This variable was originally a string variable, so I recoded it into a numeric variable (sex) in order to run my analyses.

ACADEMIC SUCCESS AND ENGAGEMENT. The effects of academic success and engagement were explored using the following variables: CSCCQ02, "How well do you think you are doing in your school work?" and CSCCcQ03, "How important is it to you to do the following in school: get good grades?" Both variables are inversely measured by means of a scale. CSCCQ02 is measured using a 5-point scale, where 1 = very well, 2 = well, 3 = average, 4 = poorly, and 5 = very poorly. Values 1-3 and values 4-5 were collapsed. CSCCcQ03 is measured using a 4-point scale, where 1 = very important, 2 = somewhat important, 3 = not very important, 4 = not important at all. For the second variable, values 1 and 2 and values 3 and 4 were collapsed to make two categories. The missing values were also removed for both variables. Initially, I planned on creating a scale for academic success, however there was a low reliability (Cronbach's alpha = .307). Instead, a dummy variable (academic_success_OR) combined both variables in a conditional "or" statement, where 1 = high importance/ success and 0 = low importance/ success.

PERCEIVED PEER ACCEPTANCE. Lastly, questions on peer acceptance included CFFCQ01, "I have many friends," CFFCQ02, "I get along easily with others my age," CFFCQ03, "Others my age want me to be their friend," CFFCQ04, "Most others my age like me, and CFFCcQ4A, "I feel that my close friends really know who I am." Each of these were measured using a scale of 1 through 5 (1 = false, 2 = mostly false, 3 = sometimes true/ sometimes false, 4 = mostly true, 5 = true). Since they were all measured the same way, I combined them to obtain a scale for perceived peer acceptance (peer_accept_NEW) and I removed the missing values.

Analytic Plan

The analysis for my research occurred over multiple steps. First, I completed univariate analyses, to ensure that there were enough responses in each group to warrant further testing and to understand the distribution of my variables (Singleton & Straits, 2018, p. 502). I conducted univariate analyses for my dependent variable self-esteem, and my independent variables participation in extracurricular activities, type of activity, age, sex/ gender, academic success and engagement, and perceived peer acceptance.

Next, I performed preliminary hypothesis testing through bivariate analysis, which allowed me to test the relationship between two variables (Singleton & Straits, 2018, p. 511). This section was divided into three steps. First, I looked at the relationship between self-esteem and the independent variables (participation, type of activity, age, sex/ gender, academic success, peer acceptance). Since self-esteem is coded as a continuous scale and the independent variables as dummy variables, I used ANOVA to determine significance. However, I conducted a correlation when looking at the relationship between self-esteem and perceived peer acceptance as they are both continuous variables. Second, I completed cross-tabulations to look at the effects of the independent variables on participation in extracurricular activities (which temporarily became my dependent variable) and tested the significance by means of a chi-square. I used bivariate logistic regression when looking at the relationship between perceived peer acceptance and participation, since the independent variable in this relationship is a continuous variable. By performing each of these analyses with both self-esteem and participation, it helped me better understand the relationships between each of my variables and whether they are statistically significant.

Lastly, I conducted a multivariate analysis to test my hypothesis (Singleton & Straits, 2018, p. 535). To do so, I used multiple linear regression to explore the effects of multiple independent variables, in this case, partici-

pation, each type of activity, age, sex/ gender, academic success/ engagement, and perceived peer acceptance, on the dependent variable self- esteem. I also ran a set of multiple logistic regression analyses for participation and each of the types of activities, like I did with the crosstabulations. I chose to use logistic regression for this section because participation is my dependent variable, and it is dummy coded. In doing so, I was able to see how each variable impacts participation and self-esteem, as well as the relationship between participation and self-esteem. This allowed me to clearly identify which variables affect the relationship between participation in extracurricular activities and self-esteem and how. In performing these three steps (univariate, bivariate, and multivariate analyses), I was able to understand how each variable interacts with participation in extracurricular activities to influence self-esteem.

Results

As described in figure 1, the first univariate analysis demonstrates that my sample recorded a relatively high self-rated self-esteem with a mean score of 4.20 out of 5. The vast majority (98.26%) of the participants in the sample were enrolled in some type of extracurricular activity. When I broke it down by type of activity, I found that 92.6% were involved in individual sports, 77.5% were involved in team sports, and 60.0% participated in non-athletic activities (figures 2, 3, 4, 5). Further, I discovered that my sample had an equal distribution of age and sex/ gender (figures 6, 7). Interestingly, I found that 99.42% of respondents recorded having high academic success and engagement and that most youth experienced a high perceived peer acceptance, with a mean of 4.30 out of 5 (figures 8, 9).

BIVARIATE ANALYSES. Once I completed the descriptive statistics for my sample, I conducted the bivariate analyses as described above. I found that participation in extracurricular activities (participation_activities_OR) was not found to be statistically significant when doing an ANOVA test with self-esteem, and neither was participation in individual sport and self-esteem. However, statistical significance was established between participation in team sport and self-esteem ($p < 0.001$) and participation in non-athletic activities and self-esteem ($p < 0.001$). I found that participation in team sport or non- athletic activities leads to higher ratings of self-esteem than those who do not participate (figures 10, 11). In fact, those who participated in team sports had a mean self-rated self-esteem of 4.29/5 compared to a mean of 4.19/5 for those who did not participate (figure 10). Similarly, those who participated in non-athletic activities scored a mean self-rated self-esteem of 4.30/5 compared to 4.12/5 for those who were not involved (figure 11).

I also found that the remaining independent variables, age ($p < 0.001$), sex/gender ($p < 0.001$), and perceived academic success ($p < 0.001$) were all statistically significant when looked at in relation to self-esteem with ANOVA. I found that self-esteem decreases as respondents entered puberty. In other words, as they aged, their self-esteem decreased (mean 4.35/5 at ages 10-11, 4.14/5 at ages 12-13, 4.05/5 at ages 14-15) (figure 12). When looking at sex/ gender, the analysis revealed self-esteem with a mean of 4.26/5, compared to their female counterparts at 4.12/5 (figure 13). Further, having a high perceived academic success is linked to increased self-esteem (mean of 4.20/5 vs 3.38/5 for those with low), although this result should be interpretated cautiously, as 99.42% of participants claimed to have high academic success (figure 14).

As explained in the previous section, perceived peer acceptance was coded as a continuous scale and thus, analyzed with self-esteem by means of a correlation. The analysis demonstrated a low statistically significant (< 0.001) correlation, where increased perceived peer acceptance leads to increased self-esteem among youth (correlation coefficient = 0.381) (figure 15).

After looking at the relationships between self-esteem and the independent variables, participation in extracurricular activities (and each type of activity) temporarily became my dependent variable to see whether the independent variables also impact respondents' likelihood of participating in activities to begin with. I used cross-tabulations when looking at sex, age/ gender, and perceived academic success and participation and bivariate logistic regression when analyzing perceived peer acceptance and participation.

It was only statistically significant when looking at participation in non-athletic activities ($p = 0.009$; figure 20). Respondents aged 10-11 were more likely to participate in non-athletic activities (65.1%) than those who were aged 12-13 (60.8%; figure 20), both of which were also statistically significant. It is important to note that the age group 14- 15 was not asked any questions about their participation in extracurricular activities and thus they were coded as missing for these analyses.

Next, males are more likely to be involved in independent sport (93.6%) compared to females (91.6%) ($p = 0.023$; figure 16). I found that males are also more likely to be involved in team sports (79.6%) compared to females (75.3%) ($p = 0.002$; figure 18). As for non-athletic activities, I found that more females participate (68.7%) than males (58.0%) ($p < 0.001$; figure 21).

After completing the bivariate logistic regression, I found a positive relationship between both perceived peer acceptance and independent sport ($p = 0.028$; figure 17), and perceived peer acceptance and team sport ($p < 0.001$; figure 19). As perceived peer acceptance increases, youth are more likely to be involved in both independent sport ($B = 0.194$; figure 17) and team sport ($B = 0.322$; figure 19).

MULTIVARIATE ANALYSES. Finally, multivariate analyses were conducted to determine which independent variables affected self-esteem the most. I ran two regressions with self-esteem as the dependent variable. The first included all age groups without participation. The second included age groups 10-11 and 12-13 and participation. I had no choice but to run two regressions for this dependent variable as I wanted to see the effects of age alongside the other variables on self-esteem, but unfortunately, age groups 14-15 were not asked about their participation in extracurricular activities. After running the second analysis, I found that participation was not significant. I also ran a set of multiple logistic regressions with participation and the three types of activities as the dependent variable, like I did when I ran the crosstabulations. Once again, this allowed me to see how the independent variables affect participation in extracurricular activities, which can then be related to self-esteem.

In the first multiple linear regression, I considered the effects of age, sex/ gender, academic success, and peer acceptance on self-esteem. Since all age groups were asked about self-esteem, ages 14-15 became the reference group. Sex/ gender and academic success were both dummy variables where male and high academic success were the reference groups. In this analysis, all independent variables were significant (< 0.001; figure 23). Age scored a positive B-value, which means that younger respondents had higher self-esteem compared to the oldest group (ages 10-11: B=.376; ages 12-13: B=.132; figure 23). Sex/ gender scored a negative B-value, which demonstrates that males have higher self-esteem than females (B=-.219; figure 23). Both academic success and peer acceptance also scored positive B-values, which tells me that those with high academic success tend to have higher self-esteem (B=.620) and those with greater perceived peer acceptance also rate themselves as having a higher self-esteem (B=.462; figure 23). Based on the standardized beta coefficients, age (B=.255) and perceived peer acceptance (B=.421) appear to have the greatest impact on self-esteem among youth (figure 23).

Figure 23. *Self-esteem X age (14-15 as reference), sex/gender, academic success, peer acceptance.*

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound
1	(Constant)	1.513	.126		11.994	<.001	1.265	1.760
	age_10_11	.376	.021	.255	17.935	<.001	.335	.417
	age_12_13	.132	.023	.082	5.824	<.001	.088	.176
	sex_dummy	-.219	.018	-.151	-12.424	<.001	-.253	-.184
	academic_success_OR	.620	.114	.066	5.431	<.001	.396	.844
	peer_accept_NEW	.462	.013	.421	34.369	<.001	.435	.488

a. Dependent Variable: self_esteem_NEW

After running the analyses with self-esteem as the dependent variable, I completed various multiple logistic regressions with participation and the types of activities as the dependent variable. None of the independent variables were significant for participation in extracurricular activities in general. However, the results differed between types of activities. Figure 24 demonstrates that both sex/gender (sig = 0.026; B-value = -0.298) and perceived peer acceptance (sig = 0.037; B-value = 0.213) were significant independent variables for independent sport. The negative B-value for sex/ gender shows that more males participated in independent sport and the positive B-value for peer acceptance demonstrates that increased peer acceptance leads to greater participation.

Figure 24. *Independent sport X age (12-13 as reference), sex/gender, academic success, peer acceptance, self-esteem.*

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	age_10_11	-.179	.139	1.666	1	.197	.836
	sex_dummy	-.298	.134	4.924	1	.026	.742
	academic_success_OR	.207	.919	.051	1	.822	1.230
	peer_accept_NEW	.213	.102	4.338	1	.037	1.237
	self_esteem_NEW	.004	.105	.002	1	.966	1.004
	Constant	1.691	.980	2.979	1	.084	5.427

a. Variable(s) entered on step 1: age_10_11, sex_dummy, academic_success_OR, peer_accept_NEW, self_esteem_NEW.

Figure 25 shows the logistic regression for team sport and the independent variables. The results were similar to those found for independent sport. Sex/ gender was found to be significant (0.001), where more males participated in team sports (B-value = -0.271). Perceived peer acceptance was also found to significantly impact participation in team sport (<0.001), where increased peer acceptance was linked to increased participation (B-value = 0.298).

Figure 25. *Team sport X age (12-13 as reference), sex/gender, academic success, peer acceptance, self- esteem.*

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	age_10_11	-.088	.086	1.052	1	.305	.916
	sex_dummy	-.271	.084	10.361	1	.001	.763
	academic_success_OR	.167	.595	.079	1	.779	1.181
	peer_accept_NEW	.298	.065	21.119	1	<.001	1.348
	self_esteem_NEW	.093	.065	2.002	1	.157	1.097
	Constant	-.377	.634	.353	1	.552	.686

a. Variable(s) entered on step 1: age_10_11, sex_dummy, academic_success_OR, peer_accept_NEW, self_esteem_NEW.

Lastly, figure 26 shows that age (sig = 0.041), sex/ gender (sig = <0.001), and self-esteem (sig = 0.034) significantly impact participation in non-athletic activities. Once again, younger respondents scored higher rates of participation in non-athletic activities (B-value = 0.151). In contrast to the previous findings, more females participate in non-athletic activities than males (B-value = 0.434). Finally, self-esteem is positively linked to participation, where increased self- rated self-esteem leads to higher rates of participation in non-athletic activities (B-value = 0.123).

Figure 26. *Non-athletic sport X age (12-13 as reference), sex/gender, academic success, peer acceptance, self-esteem.*

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	age_10_11	.151	.074	4.188	1	.041	1.163
	sex_dummy	.434	.073	35.578	1	<.001	1.543
	academic_success_OR	.257	.538	.229	1	.632	1.294
	peer_accept_NEW	.107	.058	3.410	1	.065	1.113
	self_esteem_NEW	.123	.058	4.518	1	.034	1.131
	Constant	-.996	.577	2.977	1	.084	.369

a. Variable(s) entered on step 1: age_10_11, sex_dummy, academic_success_OR, peer_accept_NEW, self_esteem_NEW.

Discussion

My research adds meaningful knowledge to the current body of research about youth and self-esteem because it considers the interaction of multiple variables, which has not been evaluated in previous analyses. The purpose of this paper was to investigate whether the participation in extracurricular activities affected the self-rated self-esteem of Canadian youth between the ages of 10 and 15 years old, and to determine how other independent variables (type of activity, age, sex/gender, academic success and engagement, perceived peer acceptance) interacted with participation in extracurricular activities and self-esteem. Upon statistical analysis, no statistically significant relationship was found between participation in extracurricular activities and self-reported self-esteem. However, age, sex/gender, and perceived peer acceptance significantly influenced both self-esteem and the likelihood to partake in extracurricular activities.

I found that age, sex/ gender, and perceived peer acceptance tend to be the most significant variables for both self-esteem and participation, which supports previous research in the field. As described in the literature review, self-esteem tends to decrease as individuals enter puberty because it is a time of confusion and self-exploration (Kort-Butler & Hagewen, 2011). This is confirmed within my work, where younger respondents report higher self-esteem (figure 12), and younger respondents participate more in non-athletic activities than older respondents (figure 20). However,

the fact that the oldest age group (14-15) was not asked about their participation in extracurricular activities presents a limitation within my work. This reduces the sample size for all the analyses with participation. Also, this creates an even smaller differentiation between age groups, where the middle group (12-13) has barely entered puberty, which is believed to be one of the leading causes of lowered self-esteem among youth (Kort- Butler & Hagewen, 2011).

My results regarding sex/ gender are also aligned with previous research. Studies show that boys tend to have higher self-reported self-esteem than girls due to positive gender roles that affirm that they are strong and capable (Daniels & Leaper, 2006; Kort-Butler & Hagewen, 2011). Past research extends this belief to participation in sports, where girls tend to feel out of place and alienated from peers if they show interest in traditionally male-dominated subjects (Daniels & Leaper, 2006; Kort-Butler & Hagewen, 2011). These findings can be found within my research as well. Figures 13, 16, 18, and 21 all demonstrate how sex/ gender impacts self-esteem and participation in extracurricular activities. I found that males tend to have higher self-esteem than females (figure 13). Additionally, I found that more males participate in independent and team sports (figures 16 & 18), while more females participate in non-athletic activities (figure 21).

I believe that the sex/ gender results are distributed as such because of the traditional gender roles that youth are subjected to. According to the World Health Organization, gender is a social construct that varies between societies and can change over time. Similarly, in the article "Gender Issues in Young Children's Literature," Tsao (2020) explains that a child's concept of gender depends on what they are exposed to in their day-to-day life, from interactions with their peers and family to reading children's books and watching television (p. 16). She explains that children's books in the 1990s (the same decade that the NLSCY's cross-sectional dataset originates from) were largely composed of male characters who had an active role, while the "female characters rarely [did] anything" (Tsao, 2020, p.16). Tsao (2020) confirms that the sexist gender roles in children's literature have remained the same even today (p. 16). This evidence suggests that the impacts of sex/ gender on self-esteem today would likely remain similar to the findings of the 1990s, thus demonstrating the relevance of this dataset.

Lastly, perceived peer acceptance is also related to past literature. As previously explained, increased perceived peer acceptance has been linked to increased self-esteem as well as increased participation in extracurricular activities (Daniels & Leaper, 2006; Mak & Fancourt, 2019; Gadbois & Bowker, 2007; Kantzas & Venetsanou, 2020; Kort-Butler & Hagewen, 2011). Figure 15 shows that there is a low correlation (p-value = 0.381, sig = <0.0011) between self- esteem and perceived peer acceptance. Perceived peer acceptance was also found to be linked to higher rates of participation for independent sport (figure 17), team sport (figure 19), and non- athletic activity (figure 22). Based on the B-values of the logistic regression, I can see that increased perceived peer acceptance increases the likelihood that one participates in team sport the most (figure 25). This makes sense because previous research shows that those with increased peer acceptance are more likely to participate in team sports because they are more likely to feel accepted by the people around them (Daniels & Leaper, 2006; Mak & Fancourt, 2019; Gadbois & Bowker, 2007; Kantzas & Venetsanou, 2020; Kort-Butler & Hagewen, 2011).

Conclusion

This study took the research a step further by implementing multiple logistic and linear regressions, thereby enhancing the body of research which was lacking in that regard. I took all the independent variables into consideration to see which ones had the biggest impact on self-esteem. By understanding which independent variables are most impactful, it became easier to draw a link between participation in extracurricular activities and self-esteem.

I concluded that one's positionality (age, sex/ gender) and perceived peer acceptance has a more significant impact on self-esteem than participation in extracurricular activities alone (figure 23). Also, sex/ gender and perceived peer acceptance are the most influential variables for participation in extracurricular activities (figures 24, 25, 26). Thus, I can understand that one's positionality affects their likelihood to participate in activities just as much as it impacts their self-esteem. These statistics highlight that there is a relationship between self-esteem and participation in extracurricular activities because of the role of one's age, sex/ gender, and perceived peer acceptance. These independent variables impact rates of participation and self-rated self-esteem which then impact each other.

This research relies on an older dataset because the 1998-1999 cross-sectional NLSCY dataset is the *only one* to consider both participation in extracurricular activities *and* self-esteem among youth. In fact, the NLSCY reused the questions about extracurricular activities in 2000-2001; but did not include the questions on self-esteem (Government of Canada, 2007). However, the government of Canada has not repeated these survey questions (participation in extracurricular activities) since 2000-2001. This means that there have not been any national surveys to determine the rates of participation in extracurricular activities among youth in Canada for over twenty years.

The United States census demonstrates that youth are participating in more clubs and sports than they did twenty years ago (United States Census Bureau, 2022). Due to the proximity and cultural similarities between Canada and the United States, I hypothesize that Canadian youth are also participating in more activities than previous generations. These findings thus become increasingly relevant, despite how old the data set is. It is imperative for future research to conduct similar surveys about self-esteem and participation in extracurricular activities on a more recent data set to determine if and how these findings may shift. ■

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THE M IN MULTICULTURALISM STANDS FOR MYTH:

THE PERFORMATIVE IDEALIZATION IN CANADA'S MULTICULTURAL POLICIES

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ABSTRACT

As described on the Government of Canada's online database, the Canadian Multiculturalism Act of 1988 is a piece of federal legislation intended to recognize multiculturalism as a fundamental characteristic of Canadian society and to preserve diverse cultural identities (Ministry of Justice, 2014, p. 1). Despite this promise, the Canadian government has failed to adequately recognize the various cultures that have been assimilated and destroyed in the name of preserving the Canadian identity. Further, many of these communities suffer from the results of institutionally constructed hate that has been directed towards them to this day. Examining the origins of Canada as it developed through the lens of Chinese Canadian and Indigenous communities, this paper will examine how assimilation is encouraged for members of these groups and new immigrants in present-day Canada, most notably in Quebec. By looking at the past and present contexts of Indigenous and Chinese Canadian communities as well as assimilation tactics in Quebec that prevent various emerging cultural identities from developing, this paper will argue that multiculturalism is sold as a performative idealization in Canada.

Keywords: *Multiculturalism, representation, legislation, inequality, minorities.*

Discrimination Against the Chinese Canadian Community

In accordance with section 3(d) of the Canadian Multiculturalism Act, the Canadian government has an obligation to recognize communities whose origins have contributed to the history of Canada (Ministry of Justice, 2014, p. 3). Despite this, many Canadians may not know that Canada was able to develop further as a country due to the number of Chinese settlers that arrived; both Chinese settlers and the first Canadian Chinatown predate the first Canada Day celebration. Ten years before Canadian confederation, the first Canadian Chinatown was established in Vancouver for the growing population of Chinese settlers. In addition to this, Chinese settlers in Canada helped create the foundations of the fur trade. Despite the significant impact Chinese settlers have had on Canadian history, acknowledgement of the community's contributions often goes underrecognized. While it is common for Canadians to learn that Chinese settlers arrived in Canada to provide cheap labor for the Canadian Pacific Railway, the truth is these settlers were here prior to that. This lack of awareness and acknowledgement demonstrates a failure of the Canadian government to comply with their own regulations on multiculturalism (Mannie, 2022).

In addition to systemic disacknowledgement of the contributions made by early Chinese immigrants to Canadian history, the Canadian government has a history of discriminatory legislation intended to discourage immigration. From 1885 to 1923, the Canadian government implemented a head tax, a fee charged to every Chinese person entering Canada. This was done to discourage Chinese immigrants from coming to Canada even though Chinese immigrants helped Canada flourish before confederation. While the Canadian government eventually ended this tax, it was replaced with the Chinese Immigration Act, another piece of legislation that excluded Chinese individuals from immigrating to Canada. The act prevented Chinese immigrants from coming into Canada unless they were businesspeople, clergy, educators, or students, and was implemented between 1923 and 1947. While implementation of the Multiculturalism Act can be seen as an attempt for the Canadian government to ameliorate past discriminative practices, this act demonstrates the government's inability to recognize the damage they had done historically and defend Chinese Canadians in the present day (Johnstone & Lee,2020, p. 74).

In 2020, the COVID-19 pandemic brought forth an increase in reported instances of anti-Asian racism (Lo et al, 2022, p. 339). The virus' Chinese origin sparked a

new wave of Yellow Peril, an anti-Chinese and anti-Southeast Asian narrative that depicts "Asians as dangerous foreigners who pose an existential threat to Western society" (Lo et al, 2022, p. 339). This perpetuated the notion that Asian, particularly Chinese, individuals carry the disease, attributing the spread to stereotypes of dirty practices such as the stereotype that they eat animals which in turn spread diseases (Lo et al, 2022, p. 340). As a result of increases in instances of anti-Asian racism, a study was done to look at discrimination-related stress among the Asian North Americans, finding that in a sample of 700 participants, one third reported experiencing discrimination firsthand. While members of communities who often face discrimination often choose to stay home in what they believe is a choice to keep themselves safe, none of the participants who reported experiencing anti-Asian racism blamed their experiences on the fact that they chose to leave their home (Perry, p. 1644, 2015, Lo et al, p.347, 2022). While the Multiculturalism Act speaks to an attempt at preserving the identity of the various ethnic groups that Canadians belong to, the failure to adequately address or reduce hate crimes in the country overshadows the aims of the act (Perry, 2015, p. 1645). The Canadian government fails to adequately protect Chinese Canadians from anti-Asian and anti-Chinese racism and adequately acknowledge the contributions Chinese settlers have made to the flourishment of this country and the discrimination they have faced at the hands of the same government that passed the Multiculturalism Act, demonstrating that there is significant disconnect from the goals of the act and reality.

Canada Reframes Indigenous Identities

The Chinese community is not the only community within Canada that has historically been wronged, forgotten, and then reframed to fit a specific narrative. Indigenous communities across Canada have not only been subjected to the colonization of their land, but forced assimilation that has resulted in significant loss of identity, which has and will continue to have generational effects on their way of life. Indigenous peoples, especially women, have struggled with accurate representation and cultural perceptions since the colonial age. In their logs, European colonizers depicted Indigenous women, specifically mothers, as monstruous creatures with relation to the devil due to different birthing practices (Morgan, 1997 p. 176). Additionally, European writers reported physical differences in the bodies of European and Indigenous women. The long breasts of Indigenous women were considered to represent savagery and the capability of cannibalism, while the smaller breasts of European women were depicted as modest, virginal and generally attractive (Morgan, 1997 p. 177,). Indigenous communities, specifically women, were seen as inferior because their cultural practices were different than those of European colonizers. This belief in the superiority in Eurocentrism has continuously been used to diminish Indigenous culture throughout Canadian history, as seen in the creation of residential schools and the Indian Act.

Residential schools across North America were created as means of obliterating Indigenous identities within Canada via assimilation (Woolford & Gacek, 2016, p. 403). In Canada from the late 1870s until 1996, 150,000 Indigenous children from the ages of 4-18 went through this school system (Woolford & Gacek, 2016, p. 404). In addition to the complete repression of Indigenous culture, many children were killed in these schools, with survivors lacking familial socialization, knowledge of their native languages, and community attachment (Woolford & Gacek, 2016, p. 404).

The Indian Act was another way the government encouraged assimilation. The act was created in 1876 and was the Canadian government's way of recognizing Indigenous Canadian identity, although this was partially obtained through exclusion. The Indian Act did not allow so-called "half breeds," Indigenous people of mixed Indigenous and European descent, to qualify for the benefits of the Indian act (Lawrence, 2003, p. 9). This was done using a blood quantum requirement, which was first introduced in 1869 through the Gradual Enfranchisement Act and took away Indigenous status to Indigenous peoples if they did not have a certain amount of "Native blood" in their system (Lawrence, 2003, p. 9). As time progressed, the Indian Act underwent multiple changes that divided Indigenous communities into different categories of "Indian" through a colonial lens (Lawrence, 2003, p. 10). Indigenous women were particularly harmed by these treaties, as Native women who married White men lost their status. When initially challenged in 1971 by two Indigenous women who lost their status within the legal system, the Supreme Court of Canada ruled that the Indian Act did not discriminate against Indigenous women because in losing Native status they gained the rights of White women. This corroborated the narrative that White women are inherently superior to Indigenous women, and that Indigenous women who married White men were then given a life that was better. It was not until Sandra Lovelace, a woman of the Maliseet tribe, took her case to the United Nations that the Canadian government was forced to take action into this issue. This was recognized in the passing of Bill C-31, which gave status lost to mothers and children. However, it is important to note that this change caused turmoil within Indigenous communities who were fearful to open the doors to newcomers (Lawrence, 2003, p. 13).

The Indian Act created divides amongst Indigenous individuals and groups, which in turn made collective resistance against the Canadian government more difficult. Further, many Indigenous individuals saw the Bill C-31 as a risk to their own status, instead of viewing them as important amendments that ameliorated the effects of separation for Indigenous women who were gone from their communities for so long (Lawrence, 2003, p. 13).

When previously looking at the Canadian Multiculturalism Act, section 3(d) mentions recognition of past communities that have helped shaped Canada (Ministry of Justice, 2014, p. 3). One of the government's attempts at doing this is through its National Day of Truth and Reconciliation, also referred to as Orange Shirt Day. In accordance with the Canadian government, this day takes place every year on September 30th and individuals are encouraged to wear orange in memory of those who passed away in residential schools (Government of Canada, 2023). In addition to the vast information about Indigenous cultures that is available through the Government of Canada's website, mental health resources for residential school survivors can also be found on the website (Government of Canada, 2023). This attempts to examine and mitigate the consequences of colonialism on Indigenous communities on an individual level, rather than

taking into account the larger colonial powers at play (Burrage et al, 2020, p. 28). The Canadian government's barriers placed onto Indigenous communities will create historical and generational trauma to Indigenous peoples which involves a decolonized view on mental health to be able to comprehend (Burrage et al, 2020, p. 28). Presently, non-Indigenous Canadians are recognizing Canada's colonial past, yet many do not take accountability. This can be seen in settler "nativism" or the "Indian-grandmother complex," where North American settlers from Canada and even the United States, claim to have Indigenous heritage in an attempt to separate themselves from colonial discourse, and therefore do not suffer the disadvantages of being Indigenous in Canada (Tuck & Yang, 2012, p. 11). While the Canadian government is taking steps to recognize the effects of colonial history and policy on Indigenous communities, this recognition can be seen as performative, through historical dehumanization and forced assimilation, demonstrating contradiction between the ideals examined in the Multiculturalism Act and the reality of the country's treatment of indigenous people. This further demonstrates how Canada's policy of Multiculturalism is a hoax, especially when the people whose land we stole are one of the most severely mistreated communities in the country.

Quebec and French Assimilation

While the Canadian government has historically and presently failed to acknowledge the contributions of communities who aided in the foundation of this country such as the Chinese community as well as though who were here pre-colonialization such as Indigenous communities; the legislative push towards multiculturalism is also contrasted with Quebec's pushing a provincial identity to newcomers. Quebec has a notably stronger provincial identity than that of other provinces, which can be attributed to French being the primary language spoken. This contributes to a strong sense of provincial identity (Boyd, 2015, p. 28). Many Quebecer's view the French language, to be a part of their identity viewing the decline of French to be threatening (Boyd, 2015, p. 29). As a result of this, the Quebec government has implemented legislative barriers if student's want to go to English school as seen in section 73(1) of Bill 101 also known as the Charter of the French Language. (National Assembly of Quebec, 2024, p. 33) This bill states that only students who have a parent that is a Canadian citizen and received education in English may go to English school (National Assembly of Quebec, 2024, p. 33), this essentially means that all new immigrants must send their children to French school. Secularism constitutes an important aspect of Quebec's identity in 2024; The Quebec government has passed Bill 21, which forbids public servants from wearing religious symbols while working and requires people offering or receiving government services to have their face uncovered while doing so.

In accordance with the National Assembly of Quebec, Bill 21 is meant to promote equality among citizens and freedom of religion through the prohibition of wearing religious symbols for public sector workers, including teachers (National Assembly of Quebec, 2019, p.3). The bill is notable for its use of the notwithstanding clause and allows governments to override certain parts of the constitution such as the fundamental freedoms of persons (Government of Canada, 2022). Bill 21 overrides the fact that this bill is an infringement on a Canadian's freedom of religion, and therefore, human rights groups cannot fight the bill from this angle (Froc, 2019, p. 20). However, many groups are taking a different approach to battle this bill, approaching the disproportionate effects on Muslim women as perpetuation of gender inequality (Froc, 2019, p. 20). The Muslim community in Quebec is two times greater than the Jewish and Sikh communities combined (Froc, 2019, p. 20). Moreover, 53% of Muslim women in Canada wear a hijab and half of public sector workers are women, with more than half being teachers (Froc, 2019, p. 20). The Quebec government's position on this, specifically regarding Muslim women, is that the hijab is a sign of oppression, and that secularism will liberate them as well as make everyone equal (Froc, 2019, p. 20). Further criticism of the bill comes from the allowance of Catholic symbols, which some argue would also be prohibited if it was truly about secularism (Froc, 2019, p. 20). Despite Prime Minister Justin Trudeau seemingly opposing this bill, the federal government has not indicated that they will enforce legal action to help affected Canadians (Zimonjic, 2019).

As Quebec is home to Montreal, one of the most diverse cities in the country, there is concern these laws that put an emphasis on Quebec identity will negatively impact the presence of different ethnic groups within the city. Legislation uniquely affecting the city can also be seen in Quebec's controversial Bill 96. Bill 96 was created with the intent to protect the French language and, with few exceptions, forbids individuals who work in the public sector. These include new immigrants, who have six months to learn French before they are forbidden from being served in other languages, including for life saving services in various health care departments, even if they do not fully understand the language (Butler et al, 2021, p. 3). Ultimately, this is just another assimilation tactic for new immigrants to adopt a Quebecer identity through the French language, and it may become more difficult for the Quebec government to promote Montreal as the multicultural city they are so proud of if there is further loss of culture.

Conclusion

Despite the Canadian government having a Multiculturalism Act, there is disparity between the ideals of the legislation and the realities of many Canadians. This is demonstrated through the historical inability to properly recognize the contributions of Chinese Canadians to Canada's foundations even before it became a country. The Canadian government has also pushed discriminatory legislation through the Head Tax. Despite the apology made decades later, the Canadian government still failed to adequately protect Asian Canadians, especially Chinese Canadians, from COVID-19 related hate crimes. Additionally, inadequate attempts at reconciliation can be seen through the individualized lens through which issues facing Indigenous communities and individuals are addressed and which fail to recognize their colonial roots. Finally, discriminatory policies that force assimilation affect religious minorities and immigrants and can be seen on a provincial scale in Quebec. Overall, Canada claims to be proud of their multicultural heritage and drives to push an agenda of acceptance among different types of people, however the history and current legislation demonstrates that multiculturalism in Canada is not as successful as the Multiculturalism Act would encourage. ■

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WHO HOLDS UP THE MIRROR ?

WOMEN, NEIGHBORHOODS, AND PUBLIC EDUCATION IN BLACK MONTREAL

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ABSTRACT

The Montreal Regional Committee of the National Congress of Black Women (NCBW), acting out of the burrow of Little Burgundy, was juggling a litany of roles in their service to Black Montrealers by the 1980s. Consisting of a mere fifty members, this non-profit had begun to show vested interest in the affordable public education of their fellow Black citizens, especially in regards to the maintenance of positive self-image in the youths of their communities. One project, "Let's hold that mirror straight- Towards a positive Black image," took up much of the energy of this passionate group in 1981. However, despite concerted efforts on the part of the organization and enthusiastic second parties, the event ended up being a middling success at best. This essay will consider how the failure of the "Hold That Mirror Straight" conference reflected the wider social issues plaguing Little Burgundy as a result urban renewal projects, which had been present in the neighborhood for decades by 1981. Indeed, this work will analyze the link between the conference's lackluster success and another pivotal event which rocked the neighborhood at the end of the calendar year: the closure of the local anglophone secondary school, the Royal Arthur School. These two events, I would argue, would cast a shadow over the community for the next decade, and would mark the earliest steps towards the eventual downfall of the Negro Community Centre in 1993.

Keywords: *Women, gentrification, Afro-Canadians, public education, neighborhoods.*

Born out of the humble living room of Reverend Charles Humphrey Este, the Negro Community Centre of Montreal (NCC) first took root in the hearts and minds of Black Montrealers in 1927, nestled between the atrocities of two World Wars and finding its footing directly before the hardships of the Great Depression struck North America ("Histories of the NCC", 1981). Founded with the guiding principles of social outreach and community development in mind, the NCC sought, primarily, to "develop a social climate in which the problems of the group and of individuals [could] be discussed, and ways and means found for solving them" ("Histories of the NCC", 1981). However, intracommunity strife demanded that sister organizations be created in order to serve social and economic minorities within Montreal's diverse Black community: notably, gendered minorities.

The Montreal Regional Committee (MRC) emerged as a localized branch of the larger National Congress of Black Women (NCBW) in 1974, in order to respond to the increasing demands for gendered and youth-based serviced for Black Montrealers (Este et al., 2017, p. 85). While the Coloured Women's Club had existed for nearly half a century prior to the MRC's conception, one cannot undermine the work provided by the latter organization for the Black community of Montreal since its creation in 1974 (Newton-Thompson, 2016). Indeed, the non-profit's most notable contributions to Montreal's Black citizens from the mid-seventies onwards was its recognition of the struggles faced by Black families and children in "Anglo-Canadian" cultural and educational environments ("Educational conference", 1981). To be certain, the focus of the MRC was on providing resources to the youth and young parents of the underserved Black community of Montreal.

From archival material pulled directly from the MRC's files, it can be understood that Black Montrealers attending primarily White educational institutions grappled with the effects of both explicit and implicit forms of racism. "[P]roblems of racism in school manuals, [...] identification, [...] language communication between school authorities and black families, [...] [and the] orientation of students" were merely a handful of issues noted by the MRC as plaguing Black elementary and high schoolers during this period ("National Congress of Black Women 1980", 1980). Communication between Black parents and White educators also suffered and aggravated the issue of student mistreatment, largely due to the academic limitations of parents and, moreover, a general mistrust of the contem-

porary educational system in Canada ("Account sheets, grants [1/2]", 1981). Furthermore, facilities which promoted extracurricular academic study were limited for many individuals living across the island, causing children to struggle in their academic pursuits both within and outside of school ("Account sheets, grants [1/2]", 1981).

As a consequence of this and other sociopolitical struggles encumbering Black youths, the positive self-image of young Black Montrealer was under strain, to the degree that the MRC gathered funds and sought out the expertise of Black academics to organize the "Hold That Mirror Straight: Towards a Positive Black Image" educational conference in October of 1981 ("National Congress of Black Women 1981", 1981) Yet, the middling success of the "Hold That Mirror Straight" conference pointed to a the wider socioeconomic issues effecting the Black community, including its organizations and non-profits, in the 1980s. A lack of efficient funding, low community participation, and stalling rates of membership caused by the city of Montreal's gentrification efforts in the region of Little Burgundy (Criekingen & Decroly, 2003, p. 2462) meant community outreach efforts suffered ("Questionnaire education conference", 1981).

This essay will consider how the failure of the "Hold That Mirror Straight" conference reflected the wider social issues plaguing Little Burgundy as a result urban renewal projects, which had been present in the neighborhood for decades by 1981. Indeed, this work will analyze the link between the conference's lacklustre success and another pivotal event which rocked the neighborhood at the end of the calendar year: the closure of the local anglophone secondary school, the Royal Arthur School. These two events, I would argue, would cast a shadow over the community for the next decade, and would mark the earliest steps towards the eventual downfall of the Negro Community Centre in 1993.

To begin, one must consider the urban renewal projects which had been present in the Little Burgundy neighborhood for nearly two decades at the time of the conference's conception. In some ways, the identity of the area has historically been tied to the urban renewal project which sought to develop the region in the 1960s, with the name of 'Little Burgundy' emerging from the Jean Drapeau–Lucien Saulnier administration's designation of 265-acre sector (High, 2017, p. 33). The "slum-clearance" program, as described by the *Montreal Star* in 1965 ("$100,000 Survey Outlines Slum Area Problems", 1965), was developed in order to clear the terrain on which the bustling working-class neighborhood sat in order to build Route 136, otherwise known as the Ville-Marie Autoroute (High, 2017, p. 34). From the mid-twentieth century onwards, iconic Black institutions were razed without the informed consent of residents, notably the Black Bottom café, which had been a meeting place for Black musicians and jazz admirers from a plethora of social backgrounds (High, 2017, p. 35). However, perhaps most importantly, an innumerable number of Black individuals and families were displaced through direct expropriation notices and more subtle means of annexation, such as through the closure of large-scale businesses like factories (High, 2017, p. 35). In the seven-year period between 1966 and 1973, the population of Little Burgundy had dropped by 53% to a mere 7,000 residents (Larivière, 1973, p. 58). The environment within which the MRC was functioning in the 1980s was, thusly, one of sociocultural and demographic decline. According to the Sud-Ouest Diagnostic, a 1989 document analyzing the socioeconomic breakdown of residents of Little Burgundy, the urban renewal project undertaken by the city of Montreal was having disastrous effects on the community. By the year 1980, a mere 56% of residents in Little Burgundy lived above the poverty line ("Comité pour le Relance de l'économie et de l'emploi du Sud-Ouest de Montréal", 1989, p. 278). This, as mentioned in this work's thesis, made the demand for social outreach programs for the underserved Black community in the neighborhood pivotal for community sustainment.

The "Hold That Mirror Straight" conference was by no means the first of its kind as offered by the NCBW. The Montreal chapter of the NCBW had been focused on youth support projects since the organization's conception, with one of its formidable projects—the creation of the Umoja Basketball League—having been designed for Little Burgundy's children and teenagers in 1976 ("Recreation", 1978). Where the aforementioned 1981 conference differed from the organization's previous projects was its scope. The conference sought not only to inspire local families to take initiative in the socioemotional development of their youngest members, but indeed to make changes to the representation and treatment of Black youth on a governmental scale. As put by treasurer Velma McPhee, the conference's primary goals were fourfold: "Identifying factors that retard the teaching/learning process e.g., [...] Physical [...] Printed and Pictorial material [...] Alienation between Parent/Child [and] Discipline" ("Account sheets, grants [1/2]", 1981). The second listed factor, "Printed and Pictorial material," was in fact so integral to the MRC's planned conference that a grant was requested by the NCBW in order "to eliminate racism and sexism from textbooks used in Schools in Canada" ("Account sheets, grants [1/2]", 1981). The dual localized and national approach to the question of scholastic and socioemotional support of Black youths made the "Hold That Mirror Straight" conference one of the most ambitious and necessary projects undertaken by the organization in its seven-year existence.

Comprised of a series of professional-run workshops, the "Hold That Mirror Straight" conference should have been, by all means, a widespread success in the Little Burgundy area. Publicity campaigns through schools and other forms of media had been organized to attract attention to the event ("Questionnaire education conference", 1981), with free daycare and nursery services even being offered to attendees with infants and young children ("Education conference in-going correspondence", 1981). Although tight on funds, the MRC sought out financial aid from the federal government and other sources of revenue to fund the conference ("Education conference in-going correspondence", 1981), which they hoped to "possibly to ensure fruitful discussions ending with concrete proposals and resolutions to be presented to the various levels of Government responsible for the educational system in Montreal and in the Province of Quebec" ("Education conference in-going correspondence", 1981). Still, despite the fervent attempts from the part of the MRC to cover the costs for both the conferences and materials that would be provided to attendees, attendance rates floundered. Journalist and public administrator Iris Carrington McCracken, who had been booked as a speaker for the conference, wrote to President Vera

Jackson in order to reflect on her participation during the event: "[T]he extent and involvement of many people was not as great as it could have been, the quality and information brought out was rewarding and inspiring" ("Education conference in-going correspondence", 1981).

Organizational issues also seemed to negatively affect the outcome of the conference, with a number of guests such as Ms. Beryle Banfield noting in a post-meeting questionnaire that "[t]o increase the effectiveness of the conference (or the next conference) an effort must be made to start on time" ("Education conference in-going correspondence", 1981). Behind the scenes, innumerable but largely undescribed issues soiled the conference's ambitious plans, with secretary Mary Robertson repeatedly describing moments of "crisis" and "unbelievable snarl" in letters to potential speakers ("Education conference in-going correspondence", 1981). At its core, it seemed as if the MRC struggled to find its footing and assert itself as a legitimate institution capable of hosting such a formidable three-day event. A telling, yet disheartening letter from Mary Robertson to potential speaker Dr. Alwyn Spence summarized the strife faced by this humble regional branch of NCBW: "You may be wondering whether we were for real or not, but the complexities, and inter-relationships between ourselves and the National Body have resulted in very serious problems for us in Montreal in obtaining funding etc." ("Education conference in-going correspondence", 1981).

It is telling that a conference based on youth/parent relations had such low attendance rates. While it is unknown when exactly the Royal Arthur School closed its doors, the fact that the institution closed its doors sometime during the calendar year of 1981 meant that Black anglophone families had been filtering out of the neighborhood in droves since the beginning of the 1980s. The English-language conference's failure also spoke to the fact that the Royal Arthur School was the only anglophone school left in the area by October of 1981 (High, 2017, p. 27). As local Rosemary Woods discussed in February of 1982, a mere handful of months after Royal Arthur's formal closure, "Now English-speaking kids have to be bused out of the neighbourhood. Who wants to move down here when they have to have their children bused all the way two or three miles from here?" (Williams, 1982). As mentioned in this work's thesis, the failure of the "Hold That Mirror Straight" conference was a direct foreshadowing of the closure of Black, anglophone institutions due to low attendance numbers, all of which were connected back to the urban renewal plan which had been rocking the neighbourhood for two decades.

The middling numbers that attended the "Hold That Mirror Straight" conference and the same lack of attendance that closed the Royal Arthur School were not the lone side effects of urban renewal in Little Burgundy. To be certain, these were not lone events connected by a nebulous thread of failure, but indeed two dominos which would come to knock down the pillar of the community in less than twelve years: the Negro Community Centre, once located at the now-empty lot on 2035 Coursol Street. The trickling out of young families from the community at an increasingly rapid pace in the 1980s had disastrous effects on the once-thriving institution. According to Yvonne McGrath, the closure of the Royal Arthur School, as predicted by the disappointment of the "Hold That Mirror Straight" conference, would be the initial blow to the NCC which would lead to its total ceasing of activity in 1993: "[T]he Negro Community Centre [was hurt] because they used to prepare all the meals for the children from the school and also, they had all kinds of activities there for the children [...]" (Williams, 1981). Once the youth and families of Little Burgundy were forcefully displaced by urban renewal and its removal of work opportunities from the region, the NCC was all but left without purpose for the rest of its meagre existence. The NCC and the Black community of Little Burgundy were fundamentally connected, with the survival of one unit being intimately dependent on the survival of the other. In an attempt to cater to both their remaining members in Little Burgundy and serve the families that had left the neighborhood, the NCC attempted to decentralize their services in the years to come in order to best serve all struggling Black families in the region of Greater Montreal (High, 2017, p. 39). Despite these efforts, membership in Little Burgundy never quite reached the numbers it had once touted during the height of its near 60-year existence. Only 29.7% of NCC members during the calendar year of 1982/1983 were local to Little Burgundy, and the threat of low attendance, which had smitten the "Hold That Mirror Straight" conference and the Royal Arthur School, eventually came for the NCC ("Annual Report for 1982–83", 1983).

In spite of their shortcomings, the MRC continued to deliver educational conferences for the remaining families in the region. Four years after the "Hold That Mirror Straight" conference, the MRC hosted "Concerns of the New Black Family – A Positive Approach" at Dawson College ("1985 conference", 1985). While public feedback from the event has been lost to time, it is evident through surviving archival records that the MRC were not shaken by their previous conference, and in fact had attempted to retrieve even more funding and advertisement opportunity for their 1985 event. Regardless of their troubles historically to seduce new members into the organization or plump their attendee numbers at conferences, the MRC's continued focus on the support of Black youths and families speaks to the organization's desire for their friends and neighbours in Little Burgundy to beat the odds thrust upon them by urban renewal. In the case of the "Concerns of the New Black Family" conference, panel topics were diversified, more free services (such as daycare, lunch, and complimentary entrance fees for guests under eighteen) were provided, and an effort was made to make all panels bilingual ("1985 conference", 1985). Their inability to drive up more success for the "Hold That Mirror Straight" conference invigorated the organization to defy expectations, even as the ranks of the Black community around them thinned. In more than one sense, the sustained efforts of the MRC reflect the goals of the NCBW, which continues to thrive well into the contemporary period: "The organization continues to promote and facilitate activities and programs that foster the advancement, recognition, health and education of Black women and their families" ("About the Congress", 2022). While the NCC would eventually fall, other community pillars continued to make valued efforts in order to financially, socially, and emotionally engage with Black families living in Little Burgundy, Montreal, and beyond.

To conclude, the relative failure of the "Hold That Mirror Straight" conference was a mere side effect of the broader social issues which had been affecting the

region of Little Burgundy as a result of urban renewal projects. The urban renewal projects of the city of Montreal had simultaneously provided the area with its identity and prompted its erasure as a thriving hub for Black excellence. While Little Burgundy continues to exist as a neighbourhood today and is still laden with a rich history, remarkable present, and promising future, the individuals forcefully cast out of the region in the 1960s and onwards forever changed the institutions which once served and represented the community at large. The "Hold That Mirror Straight" conference and the subsequent closure of the Royal Arthur School were mere glimpses into the devastating future that would befall the NCC. While the NCC struggled to stay afloat in the wake of diminishing membership numbers, it was seemingly doomed to fail due to the mass exodus of youth and families from Little Burgundy between the 1960s and 1980s. However, the legacy of this remarkable institution has never been forgotten. Despite outside forces seeking to change the very fabric of the neighborhood, Little Burgundy has remained a colourful thread in the wider tapestry of Montreal history well into the 21st century. ■

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THE COMMODIFICATION OF THE WOMB: A HISTORICAL ATTACK ON BLACK WOMEN'S REPRODUCTIVE FREEDOM

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ABSTRACT

The commodification of the Black body is a process deeply rooted in slavery that has transcended a century's worth of political and social change since abolition. In a literal sense, within the context of slavery, the Black body was commodified as both a force of labour and a resource for reproduction to feed the growth of America's slave economy. In the present day, the commodification of the Black body has taken on a political and metaphorical meaning; Black women's bodily autonomy and reproductive freedom are commonly used as a form of political currency for anti-abortion lobbyists throughout the United States. This paper covers the history of the commodification of Black women's bodies while also displaying the ways in which Black women's reproductive and bodily autonomy are targeted today. Drawing on theories of the fragmented commodity, the right to privacy, and reproductive freedom, this paper displays modern issues that are part of a historical continuity of targeting black women and their right to freedom.

Keywords: *Race, class, reproduction, slavery, commodification.*

The commodification of Black bodies is deeply rooted in the history of slavery. The legacies of this commodification still persist in modern politics and the medical and judicial systems. Although the commodification of enslaved people affected men, women, and children, the commodification of the womb is a particularly female problem that has had significant repercussions for the bodily autonomy of Black women. While he bodies of slaves were exploited for their physical labour capacities, women were doubly targeted by their ability to reproduce. In the context of the Jamaican and American plantation economies, women with high fecundity were valued in a unique way that contributed to the commodification of their womb and their potential offspring (Turner, 2011, p. 42). This process involved both the separation of a mother from her child who would be born into slavery and the separation of the mother from her womb. Sasha Turner's idea of a "fragmented commodity" represents the process that separated enslaved women's value into a labouring body and a reproductive body (Turner, 2017, p. 99). Despite the abolition of slavery in the United States, the reproductive autonomy of Black women continued to be threatened by government institutions. The attack on reproductive rights predominantly targets women of colour with the goal of suppressing their bodily autonomy (Walker, 2022). Limitations on bodily autonomy have also made Black women victim to instances of discouraged reproduction through forced sterilization and coerced abortion (Davis, 1983, p. 179; Roberts, 1997, p. 187). Moreover, the birth of a Black child can be controversial, as seen in a modern case of the indiscriminate insemination of Black sperm, much to the dismay of two aspiring White parents who could not handle this "wrongful birth." (Williams, 2014). The history of this control reiterates the idea that Black women's bodies are exploited for the state's benefit, whereas during times in which this benefit cannot be achieved, Black children are discouraged from being born because they cannot be commodified.

The legality behind the commodification of the womb began with the enactment of the 1662 inheritance law, partus sequitur ventrem, in British colonial Virginia, which ensured that the status of the child followed that of their mother, thus ensuring the enslaved status would be perpetuated through reproduction (Morgan, 2022). The legalization of inherited slave status immediately gave colonial states a new way of commodifying Black bodies that specifically targeted women. The ability to reproduce and the potential benefits planters could gain from this caused women to be viewed as cattle that would produce the future generation of slaves (Berry, 2017, p. 22). The commodification of the womb created a new language that would further the process of dehumanization by likening women to livestock. Female slaves were an investment that planters hoped would appreciate, and their value was thought of in their "future increase" (Berry, 2017, p. 22). Slavery was an assault that reached into the female body and placed a price tag on the uterus, unborn children, and the mother's physical labour. As the US

expanded, the institution of slavery expanded with it to address labour shortages in newly annexed territories, which caused the price of female slaves to rise (Stanley, 2011, p. 125). The value of female slaves was in line with expansion because the demand for slaves went up as more territory was converted to serve the US plantation economy. Territorial expansion was a consequence and further cause of slavery, and Black women's bodies were forced to provide for this growth through their labour and slave production. By 1788, planters had developed a strategy to maximize profits by buying women while they were pregnant, and changing the way they punished pregnant slaves (Turner, 2011, p. 41).

Despite the value of their future offspring, pregnant women were still beaten or worked to exhaustion without regard for their unborn child's safety (Davis, 1983, p. 169). Black women's bodies and their offspring were seen as commodities of the colonial state, and this idea was not bound by geography. In the case of some Jamaican plantations, their disciplinary methods changed because they were struggling to maintain their slave population, and there were increased miscarriages resulting from physical exhaustion and injury (Turner, 2017, p. 69). Pregnancy was seen as a temporary impediment to women's working abilities but concurrent pregnancy lowered a slave's value. Planters thus wanted female slaves primarily for work but saw secondary gains in their offspring. Planters had to think of this tension if they wanted to protect their investments in labour and fertility, which ultimately resulted in new approaches to disciplining pregnant slaves. One method developed in the late 1780s involved burying a mother's stomach into the ground and whipping her back thus preventing abdominal trauma and 'protecting' the unborn child from harm. Women gained minimal protection for their pregnancies, and planters were able to maintain their authority through physical discipline. This method involved separating the mother from her womb by burying the stomach in the ground, and discipline could be given to the labouring body of a pregnant woman while the reproductive body was spared. This process reinforced women as "fragmented commodities" that planters had a vested interest in, and their potential increase would be protected while authority would be reinforced (Turner, 2017, p. 99). Despite this change, increased pressure from abolitionists, advice from doctors, and unchanging birth rates prompted planters to change discipline methods to ensure their female slaves would continue bringing wealth. Confinement took the place of flogging in Jamaican plantations but did not solve the issue of plummeting birth rates; children continued being stillborn because the conditions of confinement left women vulnerable to colds, fevers, and health conditions from malnutrition (Turner, 2017, p. 99). Excessive cruelty through violence and neglect on the part of the planters resulted in a failure to increase birth rates (Turner, 2011, p. 53). The reproduction of the slave status was established and continually sustained through violence. In an attempt to profit off of children, the commodification of the womb created a tension between violence and care that fragmented mothers.

The growth of slavery in the US was both a result of and led to further territorial expansion in the US. The symbiotic relationship between slavery and expansion encouraged the process of intentional reproduction, which emphasized women's roles as fragmented commodities. Women were herded like cattle at the end of a whip, described as merchandise, and gained value from their potential increase, which reflected the vocabulary of the slave market and contributed to the dehumanization process of commodifying the womb (Berry, 2017, p. 22). The future increase was an expectation from buyers, and purchasing slaves with the goal of breeding was an investment made by many who sought to increase their profits over the long term. Significant value was derived from fecundity, and slaves who failed to meet the expectations of buyers would be sold; a woman in Virginia was regarded as being «of very little or no value» following repeated miscarriages, and she was sold as a result (Stanley, 2011, p. 138). Although slave breeding held value, physical work was still the primary way planters turned a profit, which meant that breeding for direct sale was not the primary profit motive of slave rearing. Breeding was compelled as a secondary profit that complemented the physical labour derived from women, which reiterates women as a fragmented commodity. Forcing pregnant women to work implied their dual value. Planters could profit from the labouring ability of the body and the reproductive capacity of the womb. Separating these two parts blurred the tension between the two profit motives of slave owners and allowed them to justify overworking pregnant women.

These tensions were justified and excused in various ways. In Jamaica, planters argued that labour was necessary to ensure pregnant slaves' health (Turner, 2017, p. 85). Planters in the US argued that their desire to breed slaves was built upon love and that the institution of slavery was from the «tenderest and purest sentiments of the human heart» (Stanley, 2011, p. 134). Love and ownership were deeply entangled according to planters, who described a deeper attachment to those they had reared; the relationship between love and power was considered natural for human ownership (Stanley, 2011, p. 134). Love for human commodities and their offspring was rooted in profit, which was made possible by the language of the market, language that stripped slaves of their origin and humanity (Stanley, 2011, p. 129). A slave's African origins became more distant with each passing generation, and over time, slaves became something that was manufactured rather than someone who was stolen (Newman, 2020, p. 29). Slave owners were therefore able to declare love for a profitable object they helped create whilst distancing themselves from the dehumanizing violence and erasure that was required for these profits.

The commodification of the womb not only erased women's personhood but also alienated them from the idea of motherhood (Davis, 1983, p. 169). Many women took the means to abort their children to prevent them from being raised in a reality of violence. A Georgian doctor reported higher cases of abortion and miscarriage amongst his enslaved patients than in his White patients, which led him to believe that Black women were generally more overworked or were deliberately preventing childbirth. More extreme means, such as self-induced abortion and infanticide, were acts of desperation; a woman named Margaret Garner killed her infant daughter to prevent her from suffering through life as a female slave (Davis, 1983, p. 169). With few ways of expressing bodily autonomy, enslaved women found a level of reproductive liberty through their methods of rebellion, which challenged the commodification of their wombs.

The modern woman is free from the horrors of slavery,

but their reproductive autonomy remains at risk due to the politicization of women's reproductive freedom in the US. The recent overturning of Roe v. Wade will most impact women of colour, and factors linked to poverty such as increased incarceration rates and lack of health insurance will deter access to contraceptive care and reproductive services (Walker, 2022). Black women are nearly four times more likely to suffer a pregnancy-related death than White women, and further restricting reproductive services is likely to increase this number. The battle against reproductive freedom is one fundamentally rooted in opposition to women's rights over their bodies and perpetuates the commodification of the womb by using the rights of an unborn child as political rhetoric (Morgan, 2022). Much like the context of slavery, this model of reproductive autonomy renders women's reproductive lives as matters of legal, political, and economic intervention. Historians of slavery and those who have outlined concepts of privacy and coercion inform the rhetoric of modern pundits of bodily autonomy allowing them to contrast reproductive rights during slavery and the modern day. These comparisons shed light on the modern commodification of the womb as a reality lingering from slavery. Anti-abortion advocates use similar ideas and rhetoric against women's bodily autonomy.

Bodily autonomy is not just the access to abortion rights, and abortion rights are only part of a reality free from state intervention. Bodily autonomy encompasses a woman's right to choose whether to conceive or carry a child, as well as providing access to contraceptives, abortion, and support for a safe pregnancy (Bridges, 2020, p. 181). Since the passing of Roe v. Wade in 1973, there have been numerous political attempts at preventing abortions from taking place; methods range from using legal avenues, to targeting abortion clinics, to using overtly illegal acts such as the assassination of abortion providers (Cohen & Joffe, 2020, p. 10). However, the restriction of fundamental rights is rather different, which makes the democratic process of trampling reproductive autonomy problematic. It is hard to call a country democratic and free if one person's freedom depends on depriving another of medical care. Favouring the political and religious stance of those who do not view women's reproductive autonomy as something worth protecting creates a divide over how freedom is defined in a country that has this value protected by its constitution. Since 1973, there have been over 1,200 restrictions placed on reproductive autonomy, over one third of which have passed since 2010, which displays the rampant modern politicization of this topic. The argument against reproductive freedom is one that denies the autonomous body as a constitutionally protected right, yet places the unborn body above the mother (Morgan, 2022). This has created an environment in which women must plan their abortions based on the state they live in. Forty-three percent of women live in a state that is hostile towards abortion (Cohen & Joffe, 2020, p. 10). For those who reside in hostile states, it is crucial to expand the argument for reproductive justice beyond the access to abortion and towards access to support systems that are involved in every step of reproduction. Access to funds, transportation, and temporary accommodations for women who need to travel across state lines are key factors involved in a woman's right to choose. Around 60% of abortion patients are already mothers, the majority of them live in poverty, and they are disproportionately women of colour (Cohen & Joffe, 2020, p. 234). Reproductive support works to overcome socioeconomic and racial barriers that prevent women of colour from having access to health care services, which ensures the right to choose to bodily autonomy without state influence.

An inverse example of denying reproductive autonomy involves coerced abortion, which displays that access to abortion is only a part of reproductive freedom. Freedom from state intervention in private matters is the fundamental issue at stake. In the case of Black motherhood, Angela Davis (1971) brings forward the idea of the Black matriarch within the context of slavery (p. 4). The Black matriarch is seen as a collaborator to slavery because they perpetuate the emasculation of Black men by holding too much power in the slave household. Black women holding a minimal level of power within the semi-private household of an enslaved family was still considered a problem by the state, despite this power existing within the greater context of control exerted by white slave owners. The threat that slave owners felt by this sentiment and the subsequent creation of the Black matriarch myth reinforces the fact that the enslavement of women and the suppression of their bodily autonomy was built on the lines of race and gender. Hortense Spillers (1987) develops the meaning of this myth as anti-Black by assessing the argument of the Moynihan report from the 1960s, which claimed that the Black matriarch deters the progress of Black people as a whole (p. 65). Within a modern legal context, a similar way that Black motherhood was problematized and often pitted against a white experience was in cases involving mothers who smoked crack while pregnant, cases which overwhelmingly targeted poor and Black women (Roberts, 1997, p. 160). These cases argue against Black women's reproductive autonomy on the ground that they are unfit to be mothers, which echoes sentiments from the Moynihan report. Crack smoking was stereotypically associated with Black people beginning in the 1980s with the increasing threat of "crack babies." Black women who were accused of crack use were believed to have lost their maternal instincts resulting in a new iteration of the bad Black mother. Medical journals began publishing studies that linked babies born with medical, developmental, and behavioural problems to their mother's use of crack but ignored conditions of poverty, sickness, malnourishment, homelessness, or physical abuse that could also contribute to these conditions (Roberts, 1997, p. 164). These studies served to undermine Black motherhood by characterizing crack smoking as a Black experience that had adverse effects on children.

Returning to Davis and Spillers, like the cultural image of the Black crackhead mother, the Black matriarch is a myth used to undermine Black motherhood and distance it from the experience of White mothers. By creating this distance, Black motherhood could be seen as different and turned into something problematic. These myths were designed to imply that Black motherhood was detrimental to children, which justified the politicization of their wombs. Black motherhood was targeted for contributing to birth defects, despite the use of drugs by White women in the same manner, which speaks to the process of otherizing Black motherhood and drugs perceived as Black. In the same vein, a study of alcohol consumption during pregnancy revealed that low-income women produced children with alcohol baby syndrome at a rate of 71%, while upper-income women had a rate of 4.5% despite

drinking the same amounts (Roberts, 1997, p. 165). In this case, birth defects were a result of socioeconomic factors that affected pregnant women's nutrition and well-being.

Unfortunately, this sentiment has not been expressed in legal contexts. The rights of a fetus have been pitted against its mother, which leaves women with the choice of aborting their child or facing legal repercussions for child endangerment. An example comes from Washington in which Brend Vaughn, a pregnant Black woman with a drug addiction, was imprisoned for the duration of her pregnancy according to Judge Peter H. Wolf; she was under charges of forging cheques. This ignores the reality of prison in which the safety of the mother is not guaranteed, because the mother could suffer adverse effects from malnutrition, poor living conditions, and exposure to illness, without a guarantee that she will avoid contact with drugs (Roberts, 1997, p. 168). This case puts too much faith in the safety of imprisonment while assuming Black mothers are a danger to their children if left unmonitored by the state. This case echoes the sentiment of the Black matriarch myth, in that Black mothers who desired control over their private lives were considered threats to themselves and society.

Another case of reproductive autonomy being pressured by the state was that of Martina Greywind, who was charged with reckless endangerment for sniffing paint fumes while pregnant. Twelve days after her arrest, she got an abortion and the charges were dropped. In South Carolina, drug-addicted women face charges of two years in prison if they decide to abort their child but a 10-year sentence if they give birth. State intervention in women's reproductive freedom is not a charge against doing drugs, but one against drug-addicted women who reproduce (Roberts, 1997, p. 187). Furthermore, abortion in this modern context is informed by Davis's historical interpretation of abortions on plantations, that abortion resulting from negative circumstances is an act of desperation. Children are aborted in this modern context to avoid jail time and to prevent children from growing up with an imprisoned mother. The reproductive coercion of the plantation can still be seen in the modern legal system, because Black women are still forced to abort their children to escape state control. The image of the Black crackhead is rooted in the devaluation of Black motherhood, which separates Black women from their wombs. By punishing Black women for having children and placing the rights of these children above the mother in a courtroom, myths about Black motherhood serve to politically commodify Black children. In the modern sense, Black women are made into fragmented commodities because their unborn children are used to achieve political ends, and the mothers' bodies are used as a sight of perpetuating myths that demonize Black motherhood. In this way abortion can be seen as a viable way of avoiding legal culpability for some pregnant women because the rights of their unborn child are often held in higher regard than their own.

Another way in which the state has deprived women of their reproductive autonomy through coercive means is population control through the sterilization campaign of the mid-20th century. Prompted by ideas of preventing intergenerational poverty, the American Birth Control League (ABCL) of the mid-20th century soon took a racist edge with their ideas around reproduction (Davis, 1983, p. 176). The Birth Control Federation of America, the ABCL's successor, planned to launch its "Negro Project" in 1939, which targeted the large Black southern population who still bred "carelessly and disastrously" and were considered "least able to rear children properly" (Davis, 1983, p. 176). The federation employed Black ministers to lead local birth control committees to ensure Black people were most exposed to birth control propaganda and to promote their goal "to exterminate the Negro population" (Davis, 1983, p. 177). Many women would be victims of this campaign with Black women the most targeted. Nial Ruth Cox, a Black woman, filed suit against the state of North Carolina because she was forced to undergo sterilization or risked having her welfare payments withheld. This case was one of many with 7,866 sterilized women in North Carolina from 1933-1939 alone. Five thousand of these women were Black and were sterilized to prevent the reproduction of "mentally deficient persons" (Davis, 1983, p. 180). North Carolina continued to target Black women in the following decades with 65% of sterilizations targeting Black women from 1964 to 1983, and 43% of all women sterilized by federally funded programs were Black. With the federal government actively funding sterilization campaigns through the 20th century, many Black women were wary of the push for reproductive freedom, because it was being headed by White feminists. White feminists had previously been the ones to advocate for birth control and mass sterilization amongst Black women, with a goal to control those they deemed unfit for reproduction. The racist edge that reproductive politics took due to this program displays the ways in which Black women's reproductive autonomy has been targeted. Access to abortion is only one facet of women's reproductive autonomy, and Black women were not guaranteed to benefit from this advocacy. The lack of security caused many Black women to start their own feminist groups and advocate for an expanded version of reproductive rights that did not simply include access to abortion.

Privacy is a key idea that was added to this expanded definition of reproductive rights. The modern notion of privacy is informed by Deborah Gray White's (1985) analysis of the private lives of enslaved women (p. 126). The private lives of enslaved Black women involved cooperation and interdependence that "controlled reproduction through abstinence, abortion, and infanticide as a manifestation of resistance to slavery" (Hine, 2007, p. 19). The private worlds of enslaved women allowed them to resist the commodification of their wombs by taking control of their reproduction, which remained a secret to many slave owners. This female network allowed them to forge a private idea of womanhood in the bonds of slavery that resisted planter control (Hine, 2007, p. 20). This idea of communally-created privacy is at the forefront of modern arguments for reproductive justice and headed by Black feminists such as Dorothy Roberts and Khiara Bridges. Dorothy Roberts (1997) argues that reproductive privacy is free of state intervention and coercion, and her analysis of drug-addicted mothers highlights this (p. 189). Women being forced to choose between having a child or going to jail is a violation of privacy rights, because it gives the state control over what a woman does with her body. Moreover, imprisonment was seen as a way of protecting unborn children from drug use by their mothers, the majority of whom were Black women (Roberts, 1997, p. 192). This argument is similar to planters who justified punishing pregnant

slaves through their love for the slave's potential children. Both the modern and past cases use the supposed care for the unborn child's safety as a way of hiding their true intention of punishing the Black mother. The court cases resemble the sterilization campaign of the 20th century, because Black women were forced by the state to make the decision of motherhood. In both cases, Black women's reproductive autonomy was controlled by the state, and this control was argued as beneficial for unborn children. Forced sterilizations were used to prevent Black women from conceiving children with mental deficiencies, and courts argued for the imprisonment of mothers to prevent the adverse effects of drug use on children. Both cases rely on negative stereotypes of Black motherhood and argue that they are protecting unborn children from unfit parents. These cases create an argument that places the rights of an unborn child above the mother with the goal of controlling and limiting Black motherhood. Sterilization and coerced abortion mostly targeted Black women and politically objectified their unborn children to achieve these goals. The commodification of the womb displays the need for an expanded definition of reproductive justice that prioritizes privacy, as state intervention has proven numerous times that its involvement will attack Black women's bodies.

The expanded definition of reproductive autonomy aims to provide freedom to women by overcoming barriers of poverty that would prevent access to reproductive facilities. The majority of abortion patients live in poverty, about 60% are already mothers, and the majority of them are women of colour (Cohen & Joffe, 2020, p. 234). Deborah Gray White's idea of privacy in the context of slavery informs Khiara Bridges' idea of reproductive privacy. Privacy is a crucial right involved in reproductive justice, and poverty is another way in which privacy has been limited. Black women have been the primary victims of a system that favours the rich, because access to abortion and contraceptive facilities have been locked behind numerous financial barriers. A woman does not have procreative autonomy or privacy when she is being affected by non-legal forces such as class and race. Seventeen states offer funded Medicaid programs for medically necessary abortions that bypass federal anti-abortion legislation, while only seven states offer this program for unwanted pregnancies (Bridges, 2020, p. 184). Despite not being life-threatening, an unwanted pregnancy can affect a woman's aspirational, social, emotional, familial, and financial life and lead to a lower quality of life for their child due to financial burdens. Moreover, states that offer abortions for life-threatening pregnancies often fall into a grey area. Making an exception to the state's gestational limit usually reflects a physician's personal views on abortion, because there is little medical consensus on when to consider a pregnancy life-threatening. Physicians have to gauge the threat of pregnancy or they may face legal repercussions, and when pregnancies surpass a threshold of danger, it is usually too late to save the mother (Cohen & Joffe, 2020, p. 205). Poor women therefore cannot consistently rely on the government's Medicaid program because it is limited to region, and the success of abortion is not guaranteed in the case of life-threatening pregnancies. Courts have assumed that with or without their assistance in expanding the Medicaid program, the number of abortions from poor women would not change; courts, therefore, believe that poor women have full reproductive privacy and autonomy (Bridges, 2020, p. 185). Certain courts assume that poverty and pregnancy are the results of the moral failure of women due to criminality, promiscuity, laziness, or gambling. This assertion ignores the socioeconomic conditions of women who want abortions and contributes to the moral myths surrounding poverty. This also contributes to the perpetuation of poverty, because it denies poor women access to abortion and forces them to have a child, even if they are financially unstable. This results in a lower quality of life for both the mother and child as they are trapped in a cycle. Most women who get abortions are already mothers, live in poverty, and are Black, and these high numbers represent the demographic suffering the most form this cycle. By denying Black women access to state-funded abortions, poverty will continue to be a problem for Black women, and the state will continue to blame these women under the pretext of a moral failing, which will perpetuate negative myths about Black motherhood. The limiting of Medicaid is deliberate because it works as a compromise between restricting access to abortion, which appeases the vocal pro-life community but does not eliminate access for middle and upper-class women. Medicaid favours the reproductive liberties of wealthy women at the cost of poor women, "[t]hat is, poor women's lack of rights subsidizes wealthier women's rights" (Bridges, 2020, p. 186).

The gap in reproductive rights is one that has been created by wealth and race. This gap becomes wider when looking at women who choose to carry their pregnancy through to term. The means of carrying a pregnancy to term and having the necessary assistance are other aspects of reproductive liberty, ones that the government fails to uphold in the case of poor and Black women. Temporary Assistance for Needy Families (TANF) is a limited program that subsidizes reproductive care and entails that women will receive less financial assistance for each subsequent child, assistance ends after five years, and this assistance caps after a certain number of children (Bridges, 2020, p. 192). The government has decided how much a child is worth, that each subsequent child is worthy of less assistance, that large families do not deserve assistance, and that a family no longer requires assistance after five years. The TANF and Medicaid programs offer minimal support and contradict each other. Medicaid denies poor Black women access to abortion, while TANF encourages limited childbirth; once that limit is met, mothers may need to get an abortion that Medicaid does not fund. This contradiction perpetuates the poverty of Black women and widens the gap between the rich and poor. It denies poor mothers the basic assistance they need when choosing to have a child while not allowing poor Black women to opt out of motherhood if they are not financially ready. Only five states fully fund abortions and decline to implement the TANF family cap, which means full reproductive liberty comes down to the generosity of the state, not the supposed reproductive rights that courts claim poor women have (Bridges, 2020, p. 192). Through restrictions of Medicaid, "all will be, by the act of reproduction itself, involuntarily drafted into the service of the state, the first requirement of which is the reproduction of its populace" (Bridges, 2020, p. 196). Considering that Medicaid is used mostly by poor women, and that these women are mostly Black, TANF was created to counteract children born in poverty who are "always implicitly racialized individuals who are predisposed to criminality and/or economic dependence" (Bridges, 2020,

p. 196). Family cap policies are used to prevent Black women from reproducing too much and accruing potential state assistance, and limitations and failures of Medicaid are used to ensure these women remain poor because abortion through Medicaid is rarely practical for poor women. These programs act in tandem as a way of perpetuating the gap of rights between wealthy and poor women as well as between Black women and White women. Government programs politically commodify Black women's wombs to appease the desired rights and freedoms of the wealthy, to satisfy the vocal minority of pro-lifers, and to perpetuate poverty in the Black community by forcing Black children to inherit their mother's status. Through partus sequitur ventrem, enslaved women were forced to reproduce their status to feed the economic interests of slave owners. Today, through Medicaid and TANF, Black women are forced to reproduce to achieve the political ends of the US government, the perpetuation of poverty in the Black community, and the appeasement of the wealthy.

Previously used forced sterilization campaigns popular in the mid-20th century have since evolved into a modern form of eugenics, which can be seen with the case of Jennifer Cramblett. Cramblett filed suit against an Ohio sperm bank because her child was born Black. She sued for the mishandling of sperm and the economic and emotional loss she has experienced as a result of this "wrongful birth" (Williams, 2014). Khiara Bridges (2020) makes the point that "[i]f reproduction is responsible for the production of populations, then family cap policies enact the conviction that it is better for the community and the nation when some populations are not produced" (p. 201). By using the language of "wrongful," and arguing against the birth of a Black child, Cramblett is perpetuating myths of Blackness as something inherently wrong. She is advocating for the ability to choose what race her child should be and actively arguing against the birth of Black children. She claimed, "I'm not going to sit back and let this ever happen to anyone ever again" (Williams, 2014). The value of Blackness seems to be in constant flux. In times that Black children cannot be commodified by White people, they are branded as a mistake, one that should not happen to anyone who is White. This thinking echoes Davis's analysis of the forced sterilization and eugenics movement of the 20th century and suggests that eugenic ideas are still prevalent in modern society; people still want to prevent Black children from being born.

Restrictions on Black women's reproductive freedom have ranged from forced childbirth for economic or political interests, to coerced abortion, and eugenics. The economic commodification of the womb from the plantation has transformed into modern political commodification. Coerced abortions remain an act of terror, and eugenics has taken a shape different from its 20th-century counterpart. Each of these subjects has been researched and historicized by Black feminist scholars, and their work has informed the modern discourse surrounding reproductive politics. The groundwork made by scholars such as Angela Davis, Deborah Gray White, and Hortense Spillers has given modern scholars essential ideas about reproductive autonomy such as privacy, black motherhood myths, and coerced abortion. The concepts highlighted by previous scholars have continued to place limitations on women's reproductive autonomy. Modern scholarship has been able to use the theories of previous generations to continue the push for reproductive freedom while creating new theories of their own, such as Sasha Turner's idea of fragmented commodities and Bridges's expanded definition of reproductive freedom informed by White's idea of privacy. Through the ideas of these modern thinkers, advocates for reproductive autonomy can plainly see the harm that is perpetuated when restricting access to basic medical freedom is considered a popular political stance. Pro-life ideas of bodily autonomy reflect that of the wealthy and often white elite, much to the detriment of the poor and marginalized. Much like the plantation economy that was built upon commodifying women's bodies, the modern attack on bodily autonomy is seated in the desire to further elites vested interests: the control of a population they have deemed unworthy of the same fundamental rights. ■

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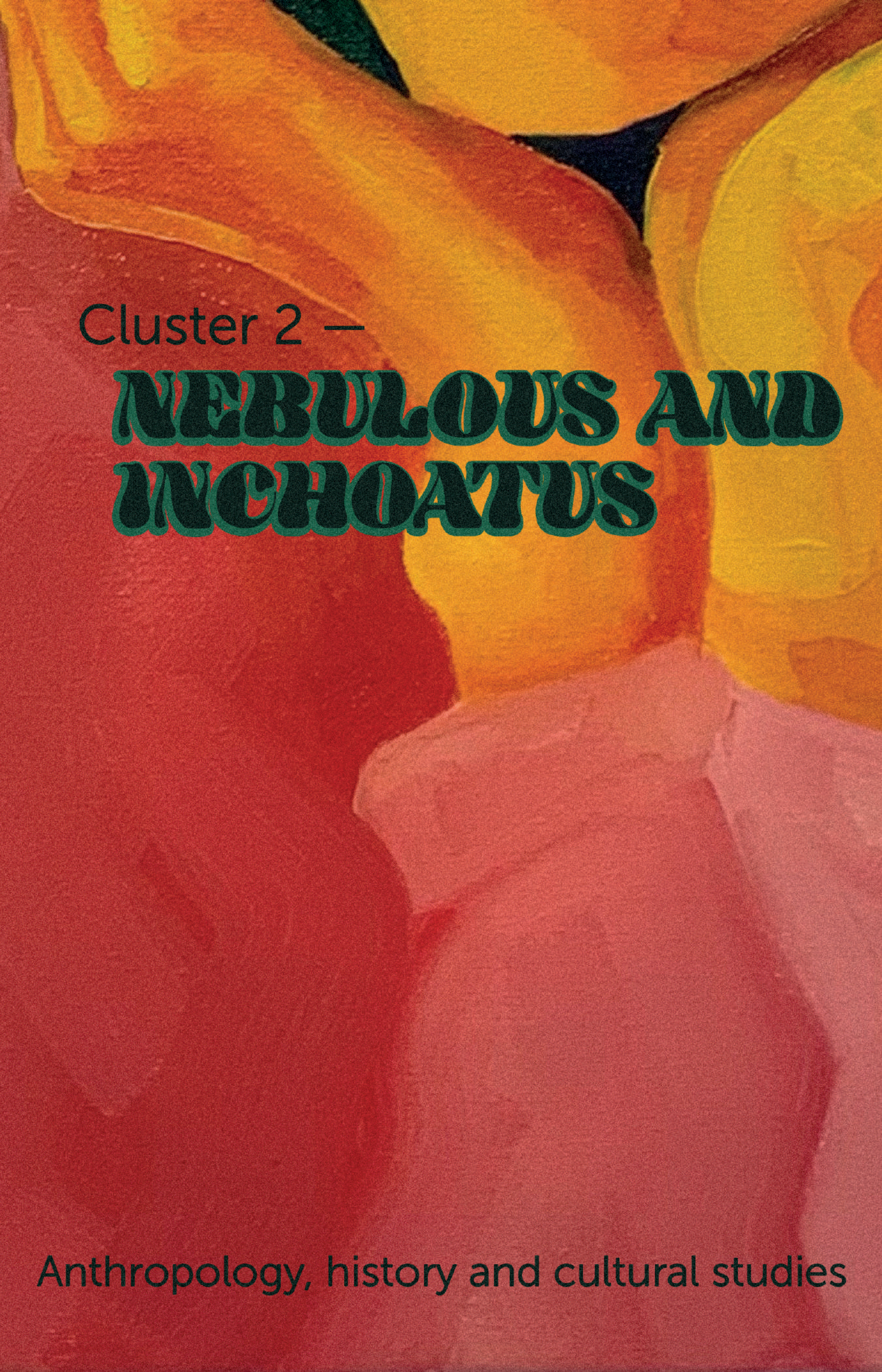
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ROOTED BONDS :

HUMAN-PLANT KINSHIP WITH INDIGENOUS PEOPLES IN THE AMAZONIA

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ABSTRACT

As the Anthropocene epoch unfolds, humans must reckon with rapid environmental and climatic changes that endanger many peoples and life forms worldwide. To contend with these threatening events, anthropology has begun redefining perspectives that recognize nonhuman actors as having agency. This shift in perspective to reconsider what makes us human and our engagement with the living world can guide us to better understand how to form caring and nurturing relationships with our living environment. Anthropological thinkers should consider the role of nonhuman beings in their studies. This includes examining how intimacy, care, and kinship are formed among human and nonhuman actors. Moving away from binary views of biological and nonbiological kinship, known as fictive kinship, will make more space to form multispecies relationships with important living creatures we have historically, and politically, divorced ourselves from.

Keywords: *Anthropology, plants, kinship, ecology, indigenous.*

Philosophical perspectives grounded in the Enlightenment era emphasize humans as actors of their own agency and recognize the human ability to do good. This perspective supports understanding the world through a human-centred approach, one in which the ultimate goal is human flourishment. Categorizing humans as qualitatively different from all other living beings (Archambault, 2023). This exceptionality of humans creates a dichotomy between humanity and animality, or the natural world. Indeed, this "enlightened" view paints nature as a "passive backdrop to human activity," thereby justifying the exploitation of natural resources for human use (Archambault, 2023). Unfortunately, the ecologically damaging implications of this view are extreme.

Similarly, anthropological thought has historically instilled other living beings with symbolic value but not agency. Other species were seen as "passive objects of human activity rather than active subjects or agents in their own right" (Archambault, 2023). However, anthropologists have been rethinking these nonhuman beings as a part of society rather than symbolic objects. In fact, multispecies ethnography, which analyzes the interaction and relationship between living beings, emphasizes the agency of other-than-human species (Archambault, 2023). While it is excellent that traditional anthropology is striving to expand its knowledge on nonhuman agency, Indigenous groups in the Amazon have long regarded plants and animals as equals.

The Indigenous peoples of Amazonia interact with many living things and inhabit together one of the world's most complex ecosystems (Kohn, 2015: 2). By focusing on Indigenous methods of human-plant kinship in three communities located in the Amazon, harmonious alternative human-plant living situations, and what happens when species coexist, can be analyzed. Kohn (2015), Maizza (2017), and Miller's (2019) ethnographies of these communities will support the anthropological development of multispecies kinship. Eduardo Kohn contributes to this argument by showing how we might rethink human language to understand how nonhuman beings use different forms of representation to communicate and engage with each other. Fabiana Maizza explains how nonhuman actors use seduction and persuasion in a manner similar to humans to create and engage in kinship relationships, while Theresa Miller talks about the importance of everyday actions of affection and care in developing and consistently upholding kinship.

Dominant theories in anthropological discourse can also give weight to the evolution of kinship and relatedness. Donna Haraway's theory (2018) that humans and nonhumans co-evolve and shape each other's identities through interconnected relationships shows how analyzing human relationships with plants could invent new practices for developing strong family relationships without being biologically related. In addition, Janet Carsten's (1995) critique of the nature vs culture debate helps to redefine what kindship and relatedness mean to anthropological thought, allowing the incorporation of human-plant relationships. These theories

emphasize the inherent worth of all life forms, and the accountabilities humans must take for their actions in the natural world.

In addition, as the Anthropocene epoch unfolds, humans face rapid environmental and climatic changes that endanger many life forms and peoples worldwide. Learning from the often-overlooked Indigenous methods of nurturing and inventing multispecies kinship with plants is crucial to taking responsibility and caring for the environment. Environment degradation will not change until humans respect and learn from these methods and rethink nonhuman beings' meaningful impact on the environment.

What it Might Mean for a Forest to Think

To begin, Eduardo Kohn challenges traditional methods of thinking in anthropology by redefining dominant assumptions about what makes us distinctly human and different from all other life forms. Through four years of ethnographic research, Kohn examines the interactions between the Runa people, located in Ecuador's Upper Amazon, and other kinds of beings such as dogs, monkeys, and trees. He observes how these relationships act as tools to engage with societal systems and other living beings. Based on his research, Kohn introduces "symbiotic anthropology" by suggesting that both humans and nonhuman beings engage in a shared semiotic system that creates a complex web of meaning and significance. Symbiotic anthropology challenges the traditional anthropological view that humans alone create and interpret meaning by arguing that all living beings are co-creators of meaning. Kohn explains that by rethinking assumptions about how meaning is formed and who has the agency to determine this meaning, we open ourselves up to what the forest might say through images and icons (Kohn, 2015, p. 222). This perspective differentiates life from inanimate physical objects and demonstrates how systems of meaning are integral to nonhuman living creatures as well as humans.

In addition, re-examining human language and its relationship to other types of representation creates a new way of listening to incorporate nonhuman beings (Kohn, 2015, p. 134). For example, in Chapter Two of Kohn's book How Forests Think, he talks about the Runa word for when a tree is chopped down and how this word corresponds to the sound that the tree makes. The Runa word, 'kakaram ', is an onomatopoeic representation of the sound a tree makes when it falls. He discusses how sounds are a form of communication, and the interpretation of the sound is shared between multiple living beings. The sound a tree makes when it falls is perceived by humans and other living beings and interpreted collectively. Therefore, Kohn explains how these signs go beyond human systems of meaning and require the establishment of relationships with nonhuman living beings.

Ultimately, Kohn's work critiques human exceptionality and demonstrates how our everyday engagements with other creatures can open new possibilities for relating and understanding. Reconsidering the agency that nonhuman living beings have helps us to see that we live in interconnected systems that are influenced not just by human actors. This contrast between the socially constructed world and objective thought beyond human language highlights that other living beings are valuable selves, capable of understanding and interpreting the world just like humans. This interconnectedness underscores our shared responsibility for the well-being of all life forms, fostering a sense of unity and collective responsibility for the natural world.

Persuasive Kinship and Seduction

Furthermore, Fabiana Maizza studied the Jarawara people in Southwest Amazonia to explain that kinship expands beyond human boundaries and prevalent dichotomies. Through her observations, she explains that kinship is intentional and that multiple kinds of ties unrelated to sexual reproduction demonstrate that affinity and alliances between different types of beings can be important constructions of kin. In particular, Maizza examines the widespread Jarawara practice of raising children not biologically related to the "parents." This practice, known as persuasive kinship or seduction, allows a child to choose to be cared for by someone who demonstrates they can provide better care than their biological parents. Seduction in this context does not equate to abandonment by the biological parents, as they often attempt to prevent it. However, once the process of seduction has begun, through feeding milk, providing toys, and spending time with the infant, the biological parents have limited recourse. However, Maizza notes that biological parents can still assert their parental role through ongoing proximity and care, highlighting that parenting is not solely linked to biological reproduction but also to the continuous effort and persuasion involved (Maizza, 2017, p. 209).

Furthermore, this notion of parenting is also associated with plants as they are thought by the Jarawara people to have human essence, souls, and human appearance. Indeed, concerns for plants are similar to those of caring for children. For example, the Jarawara people believe spending time with and talking to plants is essential for their growth as the plant's soul will listen and respond by bearing fruit (Maizza, 2017, p. 211). Central to their worldview is the concept of "Neme." Neme is an ideal world where human souls go when they have died to be reincarnated into plants. Thus, plants are essentially deceased human souls, so they must be cared for as if they are the gardener's children.

In addition, Maizza explains how plants can also seduce and persuade humans. For example, she recounts a story of a recently widowed woman in the village being seduced by a plant soul who appeared to be her lover. Maizza uses this discourse between humanity and the natural world to demonstrate how seduction and persuasion form relationships and expand kinship beyond human boundaries.

Embodied Relationships with Plant Kin

Finally, Theresa Miller's book Plant Kin focuses on Canela women and men in the Amazonia of Brazil, who care for their crops and environment with such nurturing relationships that the environment can be compared to their children. Miller explains how, in the wake of environmental threats, multispecies survival through intimate embodied relationships represents a society in dialogue with its environment. The Canela community has been subject to extreme climate change, such as recent deforestation, industrialized agriculture, cattle ranching, extreme temperatures, and rainfall changes (Miller, 2019: 2). In response to these instabilities, Canela individuals have developed caring relationships with plants that promote survival and well-being. Rather

than solely understanding gardening as cultivating foodstuffs to be consumed, gardeners focus on the intimate realities of living, growing, loving, maturing, and even dying with plant kin (Miller, 2019, p. 95). Miller explains that gardeners pass on the importance of experiences with plant children to their human children in order to continue this cycle of caring through embodied encounters. These gardeners use the language of kinship to demonstrate "crop children" as intentional actors whose happiness relies on successful gardening practices. For example, a Canela gardener states, "Seeing as I have gardens, I remember them and enjoy them, same as having a baby in my arms. I take good care of my gardens; I protect them, same as my human family" (Miller, 2019: 93). This use of kinship language elevates relationships between humans and nonhumans to the same level of importance as the bond between a parent and their child.

In addition, within the multiple Indigenous groups that speak Canela, gendered differences in raising plant kin are similar to those of raising human kin (Miller, 2019, p. 101). For example, to maintain healthy relationships with their plant kin, women visit their garden plots as frequently as possible – singing, dancing, talking, and spending time tending to their plants. Thus, women are expected to develop nurturing motherly affection and intimate relationships with crops. Similarly, women are also expected to create nurturing motherly affection and intimate relationships with their human children. In contrast, men's participation in growing plants is limited to communally celebrating and honouring crops at the start and the end of their lives (Miller, 2019, p. 122). In the same way, men have the fatherly responsibility of honouring children when they are born through ritual and community celebration. Indeed, garden parents can help plants thrive through embodied relationships. However, they can also negatively affect their plant children. In fact, by eating prohibited foods, having sexual intercourse near garden plots and other disrespectful activities, gardeners can negatively impact the growth and happiness of their plant children (Miller, 2019, p. 112).

Analysis

Rethinking human language and how we represent nonhuman beings fosters a new way of listening, enabling more profound connections with other living beings. Dominant human languages do not incorporate respect for animacy. For example, toddlers speak of plants and animals as if they are people, giving them intention and compassion (Kimmerer, 2022: 57). Yet, many languages reduce a nonhuman being to an "it," reducing a tree, for example, to an object. This creates barriers between humans and nonhumans and allows us to exploit them while absolving us of moral responsibility. Re-evaluating how to listen and communicate with nonhuman living beings is essential to accomplishing embodied and nurturing relationships with other beings.

Similarly, in her article, «The Substance of Kinship and the Heat of the Hearth," Janet Carsten argues that kinship and personhood are not fixed at birth but are developed through an ongoing process of building kinship with others (Carsten, 1995). She demonstrates how the separation between biology and culture is an ethnocentric view that validates the absolution of responsibility for other living beings and the natural world. Redefining what kinship and relatedness mean to anthropological thought allows us to center kinship as not tied to essence but to the action of doing. Therefore, kinship is a dynamic and evolving process that demands ongoing effort and engagement from all participating parties. This continuous agency in creating kinship relationships is thus applied to human relationships with animals and the natural world. This notion can easily be seen throughout Maizza and Miller's ethnography, where Indigenous communities create embodied relationships with plants through active nurturing and care.

In addition, Canela gardening is centred around multispecies kinships of care and affection. Gardening is not just about cultivating food resources but also mundane and everyday tangible interactions of intimate care and affection. These interactions are not dictated by birth relation or biological resemblance but rather by the effort of doing. Donna Haraway, in her book *When Species Meet*, explains this understanding of kin further by demonstrating that the coexistence of different species with each other blurs the boundaries between them. She states that humans cannot exist without other species (Haraway, 2008). For example, humans depend wholly on the bacteria that live inside their bodies to survive, yet this relationship is never acknowledged as equal. Moving away from binary views of what can be considered kin will create the ability to have multispecies and embodied relationships with important living creatures.

Similarly, Maizza's ethnography demonstrates how nonhuman beings use strategies such as seduction and persuasion to form relationships with other species. This active engagement expands the agency of nonhuman beings and allows for kinship beyond human boundaries. In her article *Taking Love Seriously in Human-plant Relations in Mozambique*, Julie Archambault reinforces this approach by recounting how plants in Mozambique seduce those who care for them (Archambault, 2016). This act of seduction includes plants bringing gardeners joy, helping them to ease loneliness in an environment where love is commodified and giving them fresh air to breathe. Thus, these Mozambique gardeners recognize that plants profoundly affect themselves and their environment, and demand similar time, attention and affection that human lovers would. When gardeners cared for and nurtured their plants as they would a human lover, they were rewarded by the plant's growth and beauty. While plants seduce their carers, they do not have any ulterior motives. Therefore, these interspecies relationships are considered more authentic and beautiful than human relationships (Archambault, 2016, p. 245). These relationships are seen as ideal, and a basis for what loving and trusting human relationships could look like. Similar to Maizza and Miller's research, Archambault demonstrates how, through the expression of affection, profound attachment can transform our everyday engagement with the material world (Miller, 2019, pp. 114-116). This extends to the capacity of humans to form kinship bonds with plants.

Furthermore, there is a widespread Amazonian perspective that humans and nonhumans are deeply interconnected through meaning systems. Like us, animals and nonhumans create meaning based on their personal experience and perspectives (Kohn, 2015, p. 134). These meaning systems are part of a complex network of social interactions that link all beings together. This interconnectedness and ability of nonhuman beings to

make meaning contrasts with the traditional Western beliefs of human exceptionality.

Human superiority establishes a hierarchy that places humans as the most intelligent entity and plants at the bottom, separating humans from nonhumans. Despite these dominant ideologies of human superiority, many Indigenous communities have long thought of humans as the least experienced in how to live with the planet. Robin Kimmerer, in her book *Braiding Sweetgrass*, explains that humans must look at other species for guidance as they have been on the earth far longer than humans and have had time to figure out how to live harmoniously with other species (Kimmerer, 2022: 9). An example of this harmoniously living can be seen when humans protect and celebrate the gift of fresh fruit and vegetables. This is an ultimate cycle of reciprocity, where humans care for and nurture their environment and receive food resources as a result (Kimmerer, 2022, pp. 123-124).

Furthermore, Amazonian culture and Indigenous knowledge challenge the traditional Western view of human exceptionality by emphasizing the interconnectedness of all living beings. These perspectives recognize the complex social networks and meaning-making that are not exclusive to humans but shared amongst all beings to sustain life. As Kimmerer suggests, acknowledging the experience and intelligence of nonhuman beings, like plants and animals, will guide humans to make more sustainable and harmonious relationships with the environment. This balanced relationship, where humans and nonhumans alike have agency and facilitate an ongoing process of care, can solve the eminent problems of climate destruction.

Conclusion

In conclusion, it is essential to look at Indigenous scholars of the past, present, and future to acknowledge the effects of ignoring multispecies relationships until recent human history. As Kimmerer (2022) points out, some Indigenous communities have long perceived plants as ancestors, fostering kinship and respect for the natural environment. The wealth of information about plants in Indigenous knowledge systems and biodiversity maintenance emphasizes this kinship's profound effects. Unfortunately, however, the importance of human-plant relationships to Indigenous and non-Indigenous populations has been highly underrepresented in the mainstream discussion (Miller, 2019, p. 231).

In the face of large-scale environmental destruction, humans must shift their perspective to take responsibility for their lack of affection for the natural world. Acknowledging and celebrating the reciprocal relationships between human and nonhuman actors is the first step towards developing sustainable interactions with the natural world that sustain human life. Rethinking anthropological perspectives to consider what defines humans and nonhumans and our engagement with the living world will enable us to create environmental ethics, take responsibility for destructive actions, and better understand how to form caring and nurturing relationships with our living environments. Indeed, moving away from traditional views of human kinship, we can develop embodied multispecies relationships with other living beings, from which we have historically and politically divorced ourselves. This means that humans must consider the impact of our actions on other species and the environment and actively work to value and maintain these relationships.

Furthermore, valuing and maintaining relationships with nonhuman actors breaks the boundaries of traditional kinship, offering new ways of thinking about intimacy, care and affection. Expanding these boundaries lets us reimagine what a family might look like when it includes the complex web of life around us. These nonhuman relations create new and genuine ways of being intimate and facilitate templates for alternative kinship relationships that enrich human understanding of what it means to be in a loving relationship. ■

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CHILD WELFARE PRACTICES AND FOSTER CARE : RELATIONAL REALITIES

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ABSTRACT

'Dark sides of kinship' such as the abuse some kids are subject to by, or while in the care of, their biological parents remain prevalent in our day and age. However, society's tolerance of these types of occurrences has greatly diminished. To assuage familial tragedies, formal state-run foster homes can alleviate the harmful effects caused by 'negative kinships' by offering safe havens to vulnerable children. This remedy is hardly a panacea though. By exploring three ethnographic examples and further readings from an anthropological lens, we argue that despite the protective essence foster homes entail in theory, much harm emerges from them in practice. The caretaking involved in foster care, although generally benevolent, promotes a semblance of normality that may equally mask darker aspects of the relational reality behind the precarious and sometimes deceptive 'kin solidarity' produced within these institutionalized settings. Furthermore, contemporary foster care in the West showcases how politics and kinship are entangled. This can be challenging throughout the fostering process, but especially when services - and, thus, associated relationships - are terminated. To increase the effectiveness of the protection granted to children who are severely affected by 'negative kinships,' including improving their potential prospects and well-being, we argue that it is critical that work be done to better identify and understand their embodied relational experiences.

Keywords: *institutional ethnography, child welfare, foster care, kinship disruptions, social support systems.*

Fostering or adopting individuals that are neither biologically linked to, or otherwise part of, one's own lineage is historically and cross-culturally common. Anthropologists regularly observe these kinship dynamics, and countless examples can be found amidst their ethnographies. Evans-Pritchard (1963) points in his work to the assimilation and absorption of members from the Dinka people by the Nuer, another Nilotic ethnic group in South Sudan, Africa (pp. 20-23). Read (2014) points to the practice of "sim-pua marriages" in Taiwan until the 1970s. A practice of adopting young girls to be raised alongside a couple's biological son as a sibling, but with the purpose of wedding her to their son once of age to consummate their marriage (pp. 165-168). Diggins (2017) tells of fishermen who leave their children behind with locals in Tissana, Sierra Leone, and explains how this fostering dynamic ensues, treading thinly between a relationship of care and one of exploitation. Notably, she highlights how foster children can earn a right to eat with the rest of the family through hard labour, often undertaken at the expense of their well-being (pp. 503-504). Moreover, Sahlins (2011) recounts aspects inherent to the flexible 'logics of relatedness' and informal adoption customs that constitute Inuit views of kinship. Children born on the same day may be deemed siblings despite having different parents and no biological ties, and kinship bonds may otherwise be (de)constructed as needed depending on contextual demands (pp. 5-6)[1]. This list is hardly exhaustive.

Indigenous views notwithstanding, in Europe and North America, institutionalized child welfare practices, formal adoptions, and foster care seem to be relatively recent developments. Until the late 19th century, consideration of the special needs and well-being of youth was patchy and rudimentary. Children, often treated as "miniature adults," were frequently enslaved, abused, expected to work, pay their dues, and respect unduly authority figures (Bala, 2011, p. 2; McGowan, 2010, pp. 25-27). Since then, many changes have been made to improve the care and rights granted to minors. From religious organizations to government-sponsored agencies, children have increasingly become centerfold in discussions around policies and best practices (Kufeldt & McKenzie, 2011). Sadly, 'dark sides of kinship' such as the neglect, physical and/or sexual abuse some kids are subject to by, or while in the care of, their biological parents remain prevalent in our day and age[2]. However, society's tolerance of these types of occurrences has greatly diminished.

Foster homes can alleviate the harmful effects caused by 'negative kinships' by offering spaces for love and care, where a 'mutuality of being' can flourish by engaging together in daily rituals (Carsten, 2013, p. 247; Meetoo et al., 2020; Sahlins, 2013, p. 59). This, in turn, can strengthen a child's sense of relatedness with the

1 A few specifics about these Inuit customs can also be found here: https://www.bcadoption.com/resources/articles/perspectives-inuit-custom-adoption

2 'Dark side of kinship' in this context was inspired by/modelled on the concept found in Geschiere (2003).

people in their life. Unfortunately, as will be presented, these surrogate family care environments are hardly a panacea (Whiting & Lee III, 2003). They may hurt as much, if not more, as they help (Kufeldt & McKenzie, 2011).

Our Argument

Based on the ethnographic examples we chose to explore for this paper and further readings, it seems increasingly evident that despite their intended protective function, much harm emerges from foster homes. Being a foster home caretaker involves practices of embodied care, such as feeding, cuddling, talking, and singing to the fostered child. These are crucial for a child's healthy development, especially those in precarious family circumstances (Meetoo et al., 2020). Being a foster parent, as for any parent, usually involves a great deal of sacrifice. After all, caretaking and bonding activities tend to amount to a significant investment of time and energy (Amrith & Coe, 2022; Govindrajan, 2015; Meetoo et al., 2020).

However, these normalizing features can obscure the institutionalized nature of foster homes, masking the relational realities behind the intimate bonds constructed in these places (Rutman & Hubberstey, 2011; Whiting & Lee III, 2003). Foster parents and fostered children can come to confuse 'kinship-as-doing' with 'kinship-as-being,' whereas the former involves *playing the role of* (e.g. a caretaker seen as acting *like* a parent; playing the role of a parental figure) and the latter involves *embodying the familial role played* (e.g. a caretaker perceived as a parent *de facto*, or at the very least as fully embedded in the fostered child's family structure in some form) (Amrith & Coe, 2022). Regardless of whether this confusion is encountered by the foster parent or the fostered child, or both, it can lead, as we'll see, to grave grievances down the line when the state-made kinship is terminated and effectively disposed of (Amrith & Coe, 2022; Rutman et al., 2007).

Furthermore, contemporary foster care showcases how "state politics and kinship [are] interconnected" (Andrikopoulos & Duyvendak, 2020, p. 307; Kufeldt & McKenzie, 2011). This can be a challenge throughout the fostering process, but especially when services – and thus associated relationships – come to an end when children transition into adulthood (Rutman et al., 2007). When governments and their actors play the role of "substitute parent" (Rutman & Hubberstey, 2011, p. 268), and fund networks of support that play the role of family, being shown the door at the end of the service line is difficult, and the life path thereafter uncertain. Sadly, many of these fostered individuals, if not most, fail to overcome the transition unscathed (Rutman et al., 2007).

Essay Breakdown

In the first part of this paper, we will explore three ethnographic examples. The first, in the United Kingdom, looks at fostering infants and children up to 4 years old from the perspective of those providing care (Meetoo et al., 2020). The second, in the United States, looks at the foster care experience from the perspective of children aged 7 to 12 years old (Whiting & Lee III, 2003). The third, in Canada, looks at the 'ageing out' experience of individuals who are transitioning out of dependent foster care into independent adulthood (Rutman et al., 2007).

Then, we will further explore three particularly problematic patterns that emerged from the relational realities portrayed in the ethnographic examples: (a) the prevalence of and difficulties posed by kinship disruptions, (b) the traumatic troubles linked to loss and terminations, and (c) the inconsistent and suboptimal nature of a foster family's social support system.

Ethnographic Examples

Case Study no. 1: Infancy & Early Childhood

This first ethnographic study by Meetoo et al. (2020) involved fieldwork, "interviews, observation, shadowing and photo data during multiple visits" (p. 40). It took place in the United Kingdom in the home of five female foster carers who had in their care infants and young children up to 4 years old. The project took place over a period of nine months in 2016-2017.

The study offers a glimpse of the 'mutuality of being' and 'kin solidarity' that can occur between an infant foster child and the foster carers during routine everyday rituals and activities (Govindrajan, 2015; Meetoo et al., 2020; Sahlins, 2011). It shows "how ideologies of care, parenting and education are embedded in everyday practices" and allows us to see aspects of relational realities that tend "to be invisible and taken for granted" (Meetoo et al., 2020, p. 40). These include, but are certainly not limited to "feeding, changing, playing, singing and talking to the child," as well as "cuddles" and "interaction[s] with other children in the extended foster family" including "other wider family gatherings" (pp. 45-46). This showcases the extent of 'kinship-as-doing' and how it can be mistaken for 'kinship-as-being' (Amrith & Coe, 2022). One foster carer even admits that she looks "after [the foster children] like one of [her] own" (Meetoo et al., 2020, p. 43). This is so even when it is understood by foster carers that this is "a temporary living situation until a permanent solution is found," one that lasts on average less than 2 years (p. 39). That said, given the intimate bond that is produced between caretaker and fostered child, Meetoo et al. (2020) nevertheless argue that foster carers "should be seen as everyday experts in the needs of the child" (p. 51).

Unfortunately, the study also highlights how, despite their intense involvement in the life of the foster child(-ren), including mediating visits with the child(ren)'s birth parents, foster carers tend to feel "undervalued and dismissed by social workers" (Meetoo et al., 2020, p. 51). Given that the foster carers likely have better insight on the child's development, this attitude from social workers may be detrimental to a child's best interests.

Case Study no. 2: Pre-adolescence

This second ethnographic study by Whiting and Lee III (2003) involved semi-structured interviews with 23 preteen foster children aged between 7 and 12 years old in the United States. In it, Whiting and Lee III made use of open-ended questions, storyboards, prompts, and scripts to facilitate the intervi5ty6ions asked included "How did you come to be in foster care?", "What do you think about being in foster care?", "How do you feel about your foster family?", and "What do you think is going to happen in the future?" (p. 290). Each interview lasted no more than an hour, and each child was interviewed only once. One child declined to be interviewed, and a few preferred to skip certain questions. Consent was obtained from every legal guardian

before proceeding.

The children in this study focus substantially on their socio-cultural environment and emotional experiences while in foster care (Whiting & Lee III, 2003). They spoke of their interactions with various people that make up their foster world, as well as their residual relationships with their biological kin. One child mentions how the judge had been overly harsh and unfair, unable to "keep his promises" hinting at feelings of 'institutional betrayal' (Brown, 2021; Whiting & Lee III, 2003, p. 291). Another suggests that his dislike for his foster 'mother' is an issue of kinship authenticity: "it wasn't my mama, my *real* mama." [emphasis added] (Whiting & Lee III, 2003, p. 292)[3]. Whereas another seemed more willing to accept the possibility of a 'fictive kinship' system, referring to his "foster family" as "like family" [emphasis added] (Weston, 1995, p. 94; Whiting & Lee III, 2003, p. 292). Many of the testimonies are tainted with negative emotions, anger, sadness, confusion, self-blame, and grief. They also underline the difficulty the children have in imagining their future, which was often "vague or uncertain" in their answers (Whiting & Lee III, 2003, p. 293).

This study highlights distinctions around relational authenticity and each child's ability to navigate the ever-changing nature of kinship in the process of coping with unpleasant aspects of kinship relations. It also emphasizes the extensive and significant losses these children must undergo and overcome, including but not limited to biological parents, siblings, pets, and friends. The volunteered lists of significant others and possessions the children were forced to part with seemed excruciatingly and painfully endless. However, the loss of siblings seemed particularly heart wrenching given that reliance on them was crucial to the children's emotional understanding of what they had experienced and left behind. The shared suffering in their homes of origin made the separation from each other when they were taken into care difficult to emotionally comprehend (Whiting & Lee III, 2003).

The researchers argue that this data highlights the need "for empathetic intervention[s]," adding that "practitioners need to take the time to understand and know each child individually" [emphasis added] (Whiting & Lee III, 2003, p. 293). Since the role of foster homes is to offer a safe space for vulnerable children to grow up in, perhaps taking the time to effectively listen to each of these children would indeed prove fruitful towards protecting their respective best interests.

Case Study no. 3: Transition to Adulthood

This third ethnographic study conducted and published by Rutman et al. (2007) was later summarized by two of the three lead researchers (Rutman and Hubberstey, 2011). The longitudinal study involved following 18 to 19-year-old youth 'ageing out' of government care. "Four interviews, scheduled six to nine months apart," took place "over a 2.5 year period" in British Colombia, Canada. The sample of volunteers initially included 37 youth, but this number descended to 21 by the fourth interview, due to difficulties locating participants as they transitioned out of the care system. Each semi-structured interview lasted about an hour and "explored young people's sense of connectedness with family, practical and emotional supports, and community involvement" (Rutman & Hubberstey, 2011, p. 270).

The main findings in the study underline the fragility and deficiencies of the social support systems youths must contend with after leaving the care system. The youths interviewed were left to find, build, and nurture countless types of support structures for themselves. Among those included were peer, social, family, emotional, and financial support. If any had existed to begin with, once the participants became adults, and were thus expected to manage their affairs independently, many had fluttered away (Rutman et al., 2007).

Interestingly, the support these youths mentioned turning to often seemed to satisfy specific functions with relationships being "qualified in some way," as in being conditional or limited in scope (e.g. "parents assisted *with money*," "Mom provided support *at the time*") (Rutman & Hubberstey, 2011, p. 274). This is perhaps representative of the nature of the relationships they had while in the care system. In any case, the transitional process into adulthood is described as disorienting and destabilising. The youths must renegotiate kinships and their understanding of relationships in an environment that has none of the relational anchors, but all the same concerns, shared by other youths in a comparable stage of life. Without financial support to pay for the test, a car to use for practice, or an adult to guide them, even getting a driver's license can be an incredible hurdle in comparison to youth their age without experience in the foster care system. Additionally, these youths struggle more frequently with difficulties like unstable housing and unplanned pregnancies compared to their counterparts, which can be particularly hard to navigate when you're not sure who to turn to anymore (Rutman et al., 2007; Rutman & Hubberstey, 2011).

Further Analysis – Emerging Patterns & Problems

Kinship Disruptions

In each of the ethnographic examples explored, kinship disruptions are presented. These are recursive, numerous, and unpredictable throughout the stay of most youths in the care system and seem to affect every age group (Meetoo et al., 2020; Rutman et al., 2007; Whiting & Lee III, 2003). In the first study, infants stay with foster carers on average less than 2 years (Meetoo et al., 2020). In the second study, children had been placed in an average of 3.5 foster homes, some "as many as eight," despite their young age and short time spent in the system, which was about 3 years on average in the cohort interviewed (Whiting & Lee III, 2003, p. 289). And in the third study, youths were merely expected to move on once they became adults; to dispense themselves of the services and state actors they had grown used to counting on (Rutman et al., 2007). This last disruption is characterized by Rutman et al. (2007) as "abrupt and final, akin to being discharged and displaced" (p. 46). A transition reminiscent of Amrith and Coe's (2022) idea of 'disposable kin,' where certain relations, often tainted by a power disbalance, can be cut off unceremoniously once they cease to be a contextually good fit.

Furthermore, since kinship no longer necessitates biological ties, and individuals can construct 'fictive kinships' with others with whom they share affinities, it need not be stable or predetermined (Schneider, 1984; Weston, 1995, p. 94). Additionally, according to Amrith & Coe (2022), children in particular "operate according

3 Regarding kinship 'authenticity,' see Weston, K. (1995). Forever is a long time: Romancing the real in gay kinship ideologies. In S. Yanagisako, and C. Delaney (Eds.), *Naturalizing Power: Essays in feminist cultural analysis* (pp. 87-110), Routledge.

to more flexible and processual understandings of kin," allowing them to grow easily attached to individuals by engaging with them in everyday rituals, regardless of biology or statuses (p. 308). This relational mechanism seems akin to what Sahlins (2011) refers to as 'mutuality of being,' or Govindrajan (2015) to 'kin solidarity.' So, arguably, children develop new bonds more readily, which may in turn aid them in adapting to shifting environments and fluctuating relational webs of care with relative ease (Amrith & Coe, 2022).

However, if kinship disruptions in the care system are as unrelenting as they seem to be, it nevertheless likely becomes increasingly difficult for children to sustain their natural ability to remain relationally flexible over time. In any case, this ongoing struggle does seem to eventually take a toll that is detrimental for the well-being of that youth and the adult he will eventually become (Rutman et al., 2007; Whiting & Lee III, 2003).

Loss and Terminations

In addition, the undue trauma and distress resulting from loss and termination of services and important support systems are especially difficult. Although unobservable and unclear in the first study due to the young age of the children, the other two studies show just how destructive this can be (Rutman et al., 2007; Whiting & Lee III, 2003). For example, in the second study, many youths shared painful common experiences with their siblings, resulting in strong familial bonds. Thus, state mandated separations of siblings caused unimaginable emotional harm, effectively crippling children's social support systems into adulthood (Rutman et al., 2007; Whiting & Lee III, 2003). In the process of being 'kinned' by the State, they are forced to accept 'fictive' kin and let go unwillingly and unexpectedly of their 'authentic' ones (Amrith & Coe, 2022, p. 309; Weston, 1995, p. 95 and 99; Whiting & Lee III, 2003). Yet, despite these kinship disruptions, authentic relationships with biological siblings retain their significance, with youths often rekindling with and relying on each other after 'ageing out' of the care system (Rutman et al., 2007).

Moreover, in the third study, the loss of numerous and distinct support networks when they 'age out' of the system prevents youths from securing a path for themselves (Rutman et al., 2007). In the process of being 'de-kinned' by the State, they are left having to renegotiate their identities, aspirations, and relationships whether they feel ready to do so or not (Amrith & Coe, 2022, p. 309; Rutman et al., 2007).

A Foster Family's Social Support System

Equally persistent throughout the ethnographic examples is the inconsistent and suboptimal nature of a foster family's social support system. The first study highlights how foster carers are not heard by social workers, despite seemingly being "everyday experts in the needs" of the children they have been given the task to care for everyday (Meetoo et al., 2020, p. 51). The second study highlights how fostered children are not heard by social workers, despite being able to verbalize their emotional realities and needs, and despite the therapeutic value of having one's emotions validated. The researchers argue, for example, that a more empathetic intervention approach where practitioners listen actively and offer accurate information to the children about their circumstances could help youths heal and make sense of their emotionally laden experiences (Whiting & Lee III, 2003). Finally, the third study suggests that a stronger and more supportive social network is needed to facilitate the youth's transition to adulthood and to mitigate the risks involved in the termination of care-related services (Rutman et al., 2007, p. 46-47; Rutman & Hubberstey, 2011, p. 278).

These realities are unfortunate, especially given the intended function of foster care; to protect youth. Surely, protection should imply meeting imminent daily needs as well as long-term prospective well-being. If this is indeed the case, those who know the child best (e.g. the foster parents and the children themselves) should be respected and heard by decision-makers. Instead, what is apparent on the field seems to be a type of "routinized crisis" in which relationships are always in flux, nothing ever feels certain or secure, and those with power are perpetually putting out fires instead of fostering stability and feelings of safety (Diggins, 2017, p. 505, citing Johnson-Hanks, 2005; Whiting & Lee III, 2003). Unfortunately, this prevailing crisis-driven approach seems to be letting those who are most vulnerable – our children – down.

Concluding Remarks

In conclusion, child welfare in foster care necessitates an empathetic approach to be critically assessed and improved (Kufeldt & McKenzie, 2011; Rutman et al., 2007). Kinship bonds go beyond 'blood' ties (Schneider, 1984). They fluctuate like waves on open water within these institutionalized settings; 'accumulating' and 'dissolving,' 'thickening' and 'thinning' over time through numerous "ruptures and dissolution[s]" (Carsten, 2013, pp. 247-248; Whiting & Lee III, 2003). To increase the effectiveness of the protection granted to vulnerable children who are severely affected by 'negative kinships' and kinship disruptions, including improving their potential prospects and well-being, we must work with foster families to better identify and understand their embodied relational experiences.

Institutional ethnographies, such as those presented above, are particularly well-equipped to explore these prickly areas of society. They can help us make sense of how children experience these institutionalized spaces of abrupt and recurring 'kinning' and 'de-kinning,' and in turn, offer important insight to inform future policies and best practices in social work. In any case, the testimonies and recommendations found among the anthropological case studies explored in this paper provide much evidence for the critical future exploration and improvement of the foster care system[4]. The well-being of our kids certainly warrants deeper consideration. So, let's make sure they do not go unheard. ■

4 Further readings that support these recommendations, and offer further insight of their own: Hart, R. A. (1992). *Children's participation: From tokenism to citizenship*; Ungar, M. (2004). *Surviving as a postmodern social worker: Two Ps and three Rs of direct practice.*

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UNVEILING SREBRENICA :

A DUAL PERSPECTIVE ON THE 1995 GENOCIDE UN AND VRS DOCUMENTS

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ABSTRACT

In July 1995, the Army of the Serb Republic (VRS) and paramilitary forces carried out a genocide in eastern Bosnia and Herzegovina that claimed the lives of over 8,000 Muslims. Understanding this tragic period necessitates an examination of documents from the United Nations (UN) and the VRS. According to UN documents, it was ill-equipped and underprepared to deal with the situation. Daily reports suggest insufficient resources, restricted movement, and dependence on rumors owing to limited access to information, limiting their capacity to deliver meaningful aid. VRS records illustrate the organized character of the genocide through explicit talks and coded language used to hide operations. However, critical personal histories and contextual information on the VRS members are missing, leaving unresolved questions regarding motivations. Documents from both the UN and VRS provide distinct viewpoints. UN records highlight the problems of an underprepared organization, while VRS testimony sheds light on the organized nature of the genocide. Through an analysis of daily UN reports and select testimony from VRS members at the International Criminal Tribunal for the Former Yugoslavia (ICTY), this paper argues that the shortcomings of international intervention and the deliberate, organized actions of the VRS were crucial factors in enabling the genocide at Srebrenica, shedding light on both the failures of the global community and the calculated strategies employed by those responsible.

Keywords: *Srebrenica, Genocide, Bosnian War, International Relations, Historical Analysis.*

In July 1995, the Army of the Serb Republic (VRS) and paramilitary forces carried out a genocide that caused the deaths of over 8,000 Muslims in eastern Bosnia and Herzegovina. The best way to understand what took place during this time is through documents produced by those on the ground, namely those from the United Nations (UN) and the VRS. In this paper, I will argue that the lack of detail in the real-time UN reports and the time-delayed testimony from the VRS made the analysis of this event difficult. I will use witness testimony from members of the VRS obtained at the International Criminal Tribunal for the Former Yugoslavia (ICTY), and reports from the UN to highlight the difficulties of reconstructing a comprehensive and accurate narrative of the genocide. Additionally, I will examine how these information gaps have hindered our understanding of the VRS' motivations and the international community's response to the crisis. Documents from the UN show us that participating soldiers were not given sufficient powers or supplies to adequately protect and take care of Muslim refugees. These same documents also leave out some information, notably, concerning meetings with the VRS and the transportation of refugees. Documents from the VRS illustrate that this genocide was an organized operation; however, these documents do not tell us the conditions they were written under or much of the VRS members' personal histories. The purpose of this essay is to bridge the gaps between testimonies on both sides of the war in the Srebrenica genocide and to uncover how missing pieces of information have shaped our understanding of the event and the subsequent historical narrative.

Records from the UN reveal to us that the agency was underprepared to take care of refugees and deal with the Serbian army. For example, in one of the daily reports sent from the team in Bosnia to the wider UN on July 11, "The food situation is hopeless [...] it is impossible to give any food to the refugees. Only water can be supplied" (*Dutchbat Reports from Srebrenica, July 11*, 1995, p.101). Later in that same report, when referencing the number of wounded and offering medical attention, "Dutchbat can't give much help because their supplies have not been coming in since the end of April." (*Dutchbat Reports from Srebrenica, July 11*, 1995, p.101) As an organization sent there intending to help refugees and civilians, the underwhelming support that had been sent made their job even more difficult. UN personnel were also not allowed to visit certain

areas for their own protection. This greatly limited the information they could gather, often having to rely on rumors. In this respect, it is clear why information was initially missing from real-time reports; however, withholding information made it much more difficult for outside sources to know what was needed in the enclave. The lack of information left them unprepared in terms of defense. Additionally, when thousands of refugees arrived, they were without adequate supplies of food, water, or medical care.

Missing from the UN's documents are mentions of key events in the unfolding of the Muslim genocide. The daily report from July 12 is the greatest example of this. Whereas all other daily reports are lengthy, this one is only seven lines long, and concerns the transportation of refugees out of the UN compound (*Dutchbat Reports from Srebrenica, July 12,* 1995). Although there is mention of the poor living conditions and dwindling food supplies in previous reports, we can assume that the transportation of the refugees somewhere healthier was desired by UN personnel. However, there is no indication of how transportation was arranged and with whom until the next day, when it is mentioned that the VRS had transported refugees. From other documentation, we know that Dutch officers had meetings with VRS leaders that concerned plans to transport the refugee population (Nikolić, 2003, p.2). It seems as though the information was purposefully left out of daily reports, as the authors were aware that anything they wrote would stay on the record and did not want the occurrence of the meeting to be known until a later date.

The key piece of the genocide was the segregation of the male population, as is to be believed that the VRS only wanted to kill the men. There is no mention of the men being separated until two days after this transportation began, on July 14 (*Dutchbat Reports from Srebrenica, July 14*, 1995). The authors seem at least vaguely aware of these killings as they write, "We also hear some shooting from the area of Bratunac. [...] Because the men were taken there in separate buses we fear the worst." (*Dutchbat Reports from Srebrenica, July 14,* 1995) These reports withheld information about when the UN found out about the men being taken separately, and has left historians with many questions about how the events had unfolded. There are questions surrounding the absence of an initial detailed report. Doubts exist about whether their fears stemmed solely from the shooting mentioned in the report. Uncertainty persists about whether they were suspicious of the men being separated. Additionally, concerns arise about whether earlier communication in the daily reports could have prompted action.

Documents from the VRS demonstrate the degree to which this genocide was a fast and organized operation. In many instances, the killing of Muslim men was explicitly and casually discussed among members of the Serb army. In Momir Nikolić's statement of facts and acceptance of responsibility alone, there are several examples of the genocide being discussed throughout the VRS ranks (Nikolić, 2003, pp.2-7). "The killing operation was openly discussed at the meeting," claimed Nikolić (2003, p.6). When it comes to the specific orders regarding the detention and execution of Muslim men, VRS member Dragan Obrenović stated that "[the] order came from [top general] Mladić and that everyone [...] was aware of this order" (2003, p.1). The extensive documentation of the detention and killing of men as the ultimate goal undermines any claims by the VRS that they were unaware of what was happening. Additionally, Nikolić was tasked with finding suitable buildings to perform these executions, which goes to show that it was an organized operation where prisoners were not simply brought to random locations, but instead suggests that it was planned out. Over radio communication, the VRS spoke about the genocide in code and made-up stories; the prisoners from Srebrenica were said to have come from "the place where 'Zoljani People' are" and machine operators were called in under the story that they "were to build a road" (Obrenović, 2003, p.2). The use of coded terminology suggests that they knew they were being listened to and hoped the tactic would make it more difficult to be caught. In addition, they would have had to have previously come up with and agree upon these codenames and fabricated stories, showing that this was extensively premeditated.

VRS officer testimonies do not tell us about the events leading up to these individuals, like Nikolić, being involved in the genocide and the war in general. There is little mention of their families or previous personal lives. When creating the history of an event as a historian, it is important to investigate the lives of those involved and how their pasts played into their current actions. Most soldiers join wartime armies for a reason, be it, among various reasons, patriotism or pursuing personal retaliation. In the statement of facts by Nikolić, we learn no personal information about him. There is no mention of what his life was like before the war or what moved him to join the Bratunac Brigade. Similarly, in Obrenović's statement of facts there is no mention of his past.

The testimony of Dražen Erdemović, a soldier in the 10th Sabotage detachment of the VRS stands out among ICTY documents. It is longer with more detail and includes information about his life that can help construct a full image of him as a person. When asked to describe himself, Erdemović said "I am a Croat, Bosnian Croat, by nationality and I was born in Tuzla" (1996, p.2). This demonstrates where his loyalty falls within the Bosnian war, and researching the city he was born in gives us greater insight into his childhood and upbringing. He also claims that the army "was the only option" for he and his wife, who was pregnant at the time (Erdemović, 1996, p.37). His motivations for participating were simply to find a way to take care of his growing family. Erdemović also says that he changed sides at different times throughout the war, which can help his claim of only joining the forces out of fear or wanting to support his family financially (1996, p.45). With all of this information, we can better understand what kind of a person he is, what his motivations were, and how he ended up participating in the genocide.

The VRS documents also do not include mention of the conditions under which they were produced. Incidentally, they were produced in and for courtroom proceedings. However, they do not cover the psychological conditions, like the threat of jail time facing the authors, or how information can change in the years between the actual events and the recording of them. This aspect is important when studying the documents from a historical perspective as the psychological state of the one testifying can greatly impact the information they divulge.

The VRS testimonies also do not include much information about the rest of the war. There are mentions of other key locations used by the VRS, but nothing about the overall conflict. Of course, a soldier does not know about all the events of the entire war, but information on what they do know can help historians in recreating more of the overall conflict. This also makes it difficult to know if this violence against Muslims was a widespread occurrence in VRS territory.

The documents created by both the UN and the VRS have similarities and differences among them. Firstly, they both tell the story of the genocide of Muslim people in Bosnia but from opposing sides. The UN was in Srebrenica to help the local populations and protect them from VRS violence. However, they failed this mission as they handed the Muslim population over to VRS forces and were not given enough power or resources to do anything else. VRS documentation, on the other hand, shows a premeditated and systematic strategy for carrying out the genocide, shedding light on the organization and their actions. While the UN documents focus on the limitations and shortcomings of international engagement, the VRS records reveal that the atrocities were carried out deliberately. Together, these records provide a dramatic contrast in viewpoints, emphasizing both the international community's challenges and the VRS' efficiency in attaining their targets.

The main difference between the two sets of documents is the times they were written. The reports from the UN were written in real-time as events unfolded. This accounts for leaving out information as it could simply not have been known at the time of writing. These reports capture the urgency and ambiguity of the situation, as well as the obstacles faced by UN officials who frequently worked with little information and resources. As a result, the records present a fragmented and occasionally incomplete account of the events as they unfolded, limited by the crisis's real-time constraints. In contrast, the testimonies from the VRS were produced years after the genocide had taken place, benefiting from the distance of time. This opens them up to contain more substance, as well as proper reflections on previous events. With the advantage of hindsight, these testimonies often result in a more unified narrative, as individuals were able to connect various events to present a richer, more thorough account of the genocide. This retroactive nature not only adds complexity to the narrative, but also provides the possibility of selective recall, reinterpretation, or even justification of actions. The difference in timing between these two sets of documents underscores the complexities of historical reconstruction, where the immediacy of real-time reporting contrasts with the reflective, and sometimes revisionist, nature of retrospective testimony.

The genocide in Srebrenica is a complicated event that is difficult to comprehend due to numerous gaps in accessible documentation. The discrepancies and omissions in the UN's real-time reports, alongside the delayed and sometimes incomplete testimonies from the VRS, illustrate the profound challenges historians face in reconstructing a complete and accurate account of this atrocity. These gaps not only obscure the motivations of the VRS but also complicate our understanding of the international community's response—or lack thereof—to the unfolding crisis. By bringing together stories from both sides, this paper not only highlights the difficulties in comprehending the Srebrenica genocide, but also emphasizes the significance of properly evaluating the available sources. Bridging these sources emphasizes the need to fill historical gaps, helping us to better understand the complete magnitude of the genocide and the circumstances that enabled it. ■

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FROM ANATOMICAL THEATRES TO THE STAGE: FERDINAND AND DISSECTION IN *THE DUCHESS OF MALFI*

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ABSTRACT

Unlike our 21st-century approaches to the disciplines, science and art were inextricably intertwined during the Early Modern Period. Innovations in scientific knowledge were both propagated and critiqued through various literary forms. Operating within the intersection of science and literature, this essay examines John Webster's 17th-century play, *The Duchess of Malfi,* as a vehicle for critiquing contemporary anatomical dissections. Building upon Daisy Murray's *Twins in Early Modern English Drama and Shakespeare*, and Albert H. Tricomi's "The Severed Hand in Webster's *Duchess of Malfi,*" this essay highlights the ways in which Webster engages with the anatomical dissections of his time. "From Anatomical Theatres to the Stage" begins with an overview of the history of European anatomical theatres and moves into an analysis of twinship as a dissection at birth and its implications for the early modern reader. Then, it considers Ferdinand's association to witchcraft and his embodiment of the early modern surgeon as a means to showcase the immoral nature of the performance of human dissection. Beyond its demonstration of Webster's engagement with his contemporary science, this essay ultimately illustrates the inseparability of art and science.

Keywords: *Early modern British drama, anatomical theatres, dissection, monstrous twin, witchcraft.*

First performed publicly at The Globe Theatre around 1613, *The Duchess of Malfi* is notable for its progressive themes of social mobility, female power, and corruption of the nobility. Written by John Webster, the play begins with the Duchess marrying beneath her station, angering her twin brother Ferdinand, and follows the unraveling of her court in Ferdinand's bloody quest for revenge. In addition to themes of social progression, I propose that the play includes theatrical commentary on contemporary scientific innovations. Early modern English society bore witness to revolutionary discoveries made in the domain of human anatomy. Anatomical theatres spread across Europe, and Classic theories of human anatomy were being overturned year by year. The macabre nature of anatomical theatres saw the dissection of human bodies take place in front of eager audiences. Broadly, *The Duchess of Malfi* draws attention to the immorality of these public dissections as Webster simultaneously associates the villain Ferdinand with Aristotelian pseudoscientific concepts and with newer scientific ideas that were coming to light in the early 17th century. Using the notion of the monstrous twin and the witchcraft of severed body parts, Webster has Ferdinand embody these dissected corpses as well as their surgeons as a means to illustrate the inherent violence of the dissections taking place in anatomical theatres.

The Duchess of Malfi was written in the context of late-16th century social and scientific innovation. One method characteristic of this period was the use and popularisation of anatomical theaters, amphitheatres filled with tiered rows from which an audience could observe the dissection taking place. According to Marion Mücke and Thomas Schnalke (2021), dissections had been occurring in Europe in temporary anatomical theatres for the majority of the 16th century. Perhaps the most remarkable was Andreas Vesalius's public dissection in Bologna, Italy, in 1540. This two-week-long event included 25 lectures and 26 anatomical demonstrations on three human corpses and six canine corpses. Ultimately, his work replaced that of the Greek physician Galen, which had been the main reference for human anatomy for 1400 years. Temporary anatomical theatres continued to appear throughout the century; however, towards the end of the 1500s, permanent anatomical theatres began to emerge across Europe. One appeared in Padua, Italy in 1584; another in Basel, Switzerland in 1589; a second one in Bologna, Italy in 1595; and the leading theater in Leiden, Netherlands in 1597 (Mücke & Schnalke, 2021). As for Webster's London, the Company of Barbers and Surgeons was granted the right to dissect four bodies annually as of 1540, but the first permanent anatomical theater was only built in 1636 (Mücke & Schnalke, 2021). Nevertheless, as anatomical theatres appear across Europe, their findings are circulated widely across Europe reaching both scholars and the public alike. The establishment of these permanent anatomical theatres demonstrates that human anatomy was at the forefront of scientific discussions at the time of the writing of *The Duchess of Malfi.* Thus, analyzing this work in the context of anatomy and dissection will bring to light the concerns of the period.

I propose that Webster references the dissections taking place in these permanent and temporary anatomical theatres by depicting Ferdinand's character as a monstrous twin. This depiction is achieved through Ferdinand's perverted sexual and incestuous desire as well as his lycanthropic actions. In her book, *Twins in Early Modern English Drama and Shakespeare*, Daisy Murray suggests that 16th and 17th century Britain viewed twins as aberrant; she writes, "The excess of [the parents'] sexual desire results demonstrably in an excessive birth, as two children are produced, instead of one" (2017). In the play, this excess of sexual desire is passed down to both the Duchess and Ferdinand. Where the Duchess simply desires to remarry after becoming a widow, the desire in Ferdinand seems to have been corrupted as he implicitly expresses a sexual desire for his sister. In the first act of the play, Ferdinand establishes his corrupt desire by using sexual innuendos in conversation with the Duchess, saying "women like that part which, like the lamprey, / Hath ne'er a bone in't" (Webster, 1613, 1.2.268-269). While Ferdinand brushes off this phallic imagery, the early modern audience can easily pick up on the perversion of the scene, thereby viewing him as the perverted, hyper-sexual monstrous twin.

Ferdinand's corrupted sexuality can be read in any number of ways; however, I suggest that this corruption reflects the notion of the monstrous twin held by Webster and his contemporaries. Murray refers to the influential works of Aristotle in order to depict the early modern view of twins. Speaking to the early modern fear of congenital defects and conjoined twins, she summarizes, "[Aristotle's] representation of twins as monstrosities can be seen permeating the early modern viewpoint of twinship, as twins are repeatedly not only placed outside the norm, but border on monstrous in the early modern imagination" (Murray, 2017). Ferdinand's monstrosity is evidenced not only by his incestuous desire but also by his descent into madness. After murdering his sister, Ferdinand goes mad and claims that he is «a wolf, only the difference / Was, a wolf's skin was hairy on the outside, / His on the inside." (1613, 5.2.16-18). His monstrous lycanthropy is only visible in his hairy inside unlike other wolves. While Ferdinand may not share any external, physical traits with the Duchess, the monstrous nature of twinship manifests within his body. Ferdinand's dual nature suggests a certain level of repression and positions him as a monster that can masquerade as normal among upper class society. Due to this ability, he is even more threatening to the audience than someone who bears their deformity on the outside.

Having established Ferdinand as a symbol of the Aristotelian concept of twinship, Webster then presents twins as a dissection that occurs at birth, implicating his contemporary science. After Bosola advises Ferdinand to stop torturing the Duchess, Ferdinand replies "Damn her! that body of hers, / While that my blood ran pure in't, was more worth / Than that which thou wouldst comfort, called a soul" (1613, 4.1.122-124). Ferdinand is suggesting that the Duchess's body was worth more when his blood ran through it than it is with her soul in it. This not only dehumanizes the Duchess to the point of becoming a vessel of patriarchal blood but also suggests that her body once carried Ferdinand's blood, thus uniting them. In addition, Ferdinand's final words reinforce the notion that he and the Duchess are one and the same. Upon his death, he says, "Whether we fall by ambition, blood, or lust, / like diamonds, we are cut with our own dust" (1613, 5.5.73-74). As a footnote to the play, Kinney and Katz (2022) remark that this sentence is most likely referring not to humanity, but to the twins, as Ferdinand had just called out to his sister prior to this sentence. In referring to himself and his sister as diamonds that can only be cut by each other, Ferdinand is suggesting that they are made of the same material, which reinforces their unity. Moreover, in early modern Britain, there were no sonograms or other methods of detecting whether a woman was having one baby or two. Thus, until their birth, Ferdinand and the Duchess were considered to be one. They shared a womb and were birthed together, and it is only until they emerged from the womb that they became two. Therefore, they experienced a bisection at birth, which calls to mind the dissections occurring in anatomical theatres across Europe. That being said, contrary to the editors, I believe that this notion of diamonds cutting each other also refers to the scientists cutting up other humans in anatomical theatres. Thus, this quote works on two fronts: it implies that the Duchess and Ferdinand were once one being, and it calls to mind human dissection. Overall, in tying twinship and dissection together in a single villainous character, Webster portrays a societal fear of dissection, which makes Ferdinand all the more compelling to the early modern audience.

Similar to the bisection of the twins, Webster ties his society's conception of witchcraft to Ferdinand in order to address the dissections of his time. In his article "The Severed Hand in Webster's *Duchess of Malfi*," Albert H. Tricomi (2013) links the scene in which Ferdinand offers the Duchess a severed hand with jurist Henry Boguet's *Discours exécrable des sorciers*. Indeed, this scene lends itself well to witchcraft as the Duchess says, "What witchcraft doth he practice that he hath left / A dead man's hand here?" (1613, 4.1.54-55). Tricomi (2013) specifically ties Boguet's book to demonic possession in the play, in particular to Ferdinand's lycanthropy, and argues that it speaks to a "communal anxiety that unseen agents from the demonic world will, through lycanthropic possession, sever the bonds that join [...] family member [to] family member." Building on Tricomi's work, I suggest that the hand does more than reference witchcraft; it also references the dissections of the Early Modern Period. In this scene, Ferdinand allows the Duchess to believe that the hand is his own (1613, 4.1.51-52). Thus, in allowing this dead limb to become a part of his body, he reinforces his status as a corpse for dismemberment and dissection. In fact, the process of dismemberment has already begun.

Throughout the play, Ferdinand shifts from corpse to surgeon to highlight the violent nature of dissection. Reading this hand metaphor in combination with Ferdinand's metaphorical demands for the Duchess' new husband's, Antonio's, body parts, such as "I want his head in a business" (1613, 3.5.28) and "I had rather have his heart than his money" (1613, 3.5.35-36), allows one to notice Ferdinand's repeated association with dismembered limbs. In these instances, Ferdinand steps away from his role as the dissected and becomes the dissector. In asking for Antonio's body parts, he is not unlike the early modern surgeons and physicians of London, who had to procure bodies for anatomization themselves. For example, "the body of a felon hanged at St Thomas a Watering was 'begged by the Chirurgions of London, to have made him an Anatomie'" (Sawday, 1995). As such, Ferdinand casts the anatomists in a darker light by drawing attention to their

gruesome demands. Also, this parallel between Ferdinand and surgeons allows one to read Ferdinand's inner deformity as a reference to the immorality of dissection and dissectors. Furthermore, when Ferdinand faces a true surgeon, he jumps to the defense of the dissected corpses by telling the Doctor, "I will stamp thee into a cullis, flay off his skin, to cover one of the anatomies this rogue hath set i'th' cold yonder, in Barber-Chirurgeons' Hall" (1613, 5.2.81-84). The violence of trampling a body into a broth and using skin to cover up a bodily cavity emphasizes just how horrific dissection truly is. This explicit statement made in the last act of the play concretises the metaphorical associations between Ferdinand and dissection.

No doubt aware of the parallel between anatomical theatres and playhouses, Webster wields his medium to his advantage. He takes the opportunity to criticize his social and scientific context, specifically the human dissections taking place in anatomical theatres, to audiences made up of lower-income families, sitting in the yard of the theatre, and upper-class families, watching from their private boxes. To make this criticism, Webster begins by associating Ferdinand with early modern pseudoscientific ideas such as notions of the monstrous twin, which is established through Ferdinand's perverted sexuality and lycanthropy, and witchcraft, which is represented by the severed hand. Webster, then, associates Ferdinand with dissected corpses by presenting twins as a bisection at birth. He also positions Ferdinand as a surgeon to emphasize the immorality of their dissections by having him ask for Antonio's body parts and threaten to dissect a Doctor the way a surgeon dissects corpses. This threat made towards the end of the play drives home the point that dissection is violent and horrific. Moreover, in having a villain embody dissection, the scientific process is shown to be perverted, if not entirely morally wrong. ■

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FROM FREUD TO FILM : THE UNCANNY PSYCHOLOGY OF ZOMBIES IN POPULAR CULTURE

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ABSTRACT

This paper employs a multidisciplinary framework, integrating psychodynamic theory, film studies, and cultural analysis to explore the unsettling nature of zombies and the transitional space between life and death they occupy. It connects this unease to the uncanny valley theory, where entities that resemble humans but lack intrinsic features can provoke feelings of unease. Furthermore, the paper examines cognitive dissonance, particularly in the context of the familiar and unfamiliar, the living and the dead, and the human and the monster within the zombie narrative. It also explores how many characters within zombie stories grapple with cognitive dissonance through identification and disidentification with the zombie; to cling to the human version of the zombified creature, or to dissociate the then-human from the now-monster. Ultimately, this paper unveils the intricate psychology behind the fear of zombies, highlighting the creatures as reflections of our anxieties about «the other» and as unsettling mirrors of ourselves.

Keywords: *zombies, psychodynamic theory, Gothic literature, fears, cognitive dissonance.*

For many, "zombification" is a fate worse than death. But why are we so afraid of these walking corpses? What makes these monsters dichotomously fascinating and terrifying? How has this modern creature achieved such rapid notoriety in the fantastic imagination? Through a multidisciplinary approach combining psychodynamic theory, film studies, and cultural analysis, this article will explore the psychological underpinnings of our fear of the undead. Drawing on Freud and Mori's notions of the uncanny, the zombie can be conceptualized as a liminal entity defying metaphysical frontiers of life and death. This "dual state" of existence generates cognitive dissonance as individuals simultaneously identify and disidentify with the creature. The zombie's decaying form symbolically represents our suppressed fears of death, submission, and societal collapse, while the familiar host serves as a reminder that the monster is merely a distorted version of ourselves.

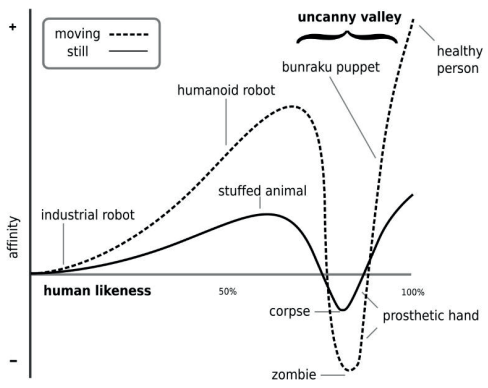
The genre's morbid inclinations have their roots in Gothic fiction, the dark underside of romantic literature that focuses on themes of repression, horror, and monstrosity (Fuchs, 2023). The Gothic operates as a mirror for humanity, addressing universal fears of the undead through motifs of body manipulation, liminality and transformation (Baker, 2014). The monstrous predecessors to zombies, Frankenstein and Dracula, served the same function, presenting readers with a reflection of the worst parts of themselves. Furthermore, Gothic literature traditionally adapts to the cultural anxieties of the times, similar to how the zombie reflects periods of social and political unrest (Baker, 2014). Indeed, the genre functions as a commentary on significant historical events and their ensuing societal fears. For instance, the pilot episode of *The Walking Dead* aired in 2010, shortly after the Great Recession, panning over deserted suburban houses to reflect a fractured American dream (Kirkman et al., 2010). The zombie thus represents a breakdown of the social order and cohesion during a time of significant economic insecurity for the United States. Hence, like the Gothic, the zombie genre addresses concerns of societal collapse and the disintegration of our systems of belonging, all hinting at an ultimate fear of the inescapable death (Baker, 2014). However, the zombie differentiates itself from other well-established creatures of the Gothic period through being a monster of modernity; werewolves, vampires and ghosts have terrorized the literature for centuries, whereas the living dead have only appeared in American culture in the last 100 years. Indeed, Romero's cult-classic *Night of the Living Dead* (1968) popularized the zombie genre in the '60s and kickstarted its slow ascension to plague our cultural consciousness. In 2011, the collective fear of an apocalypse hit its paroxysm when the Centers for Disease Control and Prevention published a precautionary guide in the event of a zombie outburst. There is thus a uniquely unsettling quality in zombified creature that appeals to modern anxieties: *The Uncanny*.

Freud and the Uncanny

The *uncanny valley* is a well-established concept among horror fiction theorists. Introduced in 1970 by Japanese roboticist Masahiro Mori, the theory attempts to generalize and explain individuals' reactions to robots given their degree of resemblance to humans. In

his research, Mori discovered that we are inclined to respond positively to human-like automatons with a high degree of realism, but do not react to industrial machines (2012). However, he identified a gap between both groups in the *uncanny valley* where certain humanoids elicited strong negative effects in respondents (Mori, 2012). He attributed this characteristically eerie feeling to the creature that is non-human but shares some of our dominant features. Mori hypothesized that our discomfort may arise from the creatures bearing resemblance to corpses, triggering our instinct to distance ourselves from the proximal source of danger (2012). The theory was dubbed after Freud's notion of the *unheimlich*, translated to the "unfamiliar", or "uncanny" in English (Bishop, 2006). Freud defines this idea as "all that arouses dread and creeping horror" (2003, p. 1). He posited that this unsettling sensation originates from the repression of the once familiar, subsequently becoming estranged from the conscious psyche (Freud, 2003). Repression protects our ego against intolerable sentiments, such as our fears and desires (Solomonova, 2022). Consequently, the uncanny is an exteriorization of the recurring anxiety produced by this ongoing repression (Freud, 2003). Other Darwinian explanations of the theory have been offered, such as that our survival instincts prompt us to circumvent individuals who appear sickly or in the process of decay (Clasen, 2010). Freud established the return of the dead as the phenomenon evoking the highest degree of distress, given that it disrupts the natural order of life and appeals to our intrinsic fear of dying (2003). The strength of our emotional reaction to death and the "insufficiency of our scientific knowledge about it" renders the repressed anxiety susceptible to resurface at all times (Freud, 2003, p. 13). Zombies are therefore a prime example of the uncanny, being a former familiarity coming back in a disturbing manner (Bishop, 2006). This concept was later adopted by film studies to predict audiences' reactions to human-like monsters in the horror genre. Notably, the zombie figures at the nadir of the diagram produce the strongest uncanny effect on individuals (see Figure 1).

Figure 1. *The Uncanny Valley Diagram, 2007, https://en.wikipedia.org/wiki/Uncanny_valley.*



In the opening scene of *Night of the Living Dead*, Barbara is driving with her brother Johnny to visit their father's grave, where he is attacked and bitten by a zombie (7:50). A morbid parallel is later drawn during the climax of the film when Johnny re-appears as part of a group of ghouls attacking the farmhouse where his sister and other survivors were seeking shelter at night (1:12:58). This unsettling return of a previously established character as a physical manifestation of his death elicits a strong negative psychological response in viewers. The uncanny thus represents a paradoxical state in which the familiar and unfamiliar are simultaneously present, creating cognitive dissonance.

Cognitive Dissonance

Cognitive dissonance is a psychological phenomenon characterized by the simultaneous maintenance of two incompatible ideas (Jarrin, 2022). In order to alleviate this discomfort, we typically disregard one of the attitudes in favor of the other (Jarrin, 2022). In many forms of media, dissonance between terror and fascination is central to the success of the horror component (Tenga & Zimmerman, 2023).

In the zombie genre, three simultaneous dichotomies interact synergistically to elicit terror and fascination: the familiar and the unfamiliar, the alive and the dead, and the human and the monster. The unique horror of the living dead resides in the form under which it appears. Unlike other gothic monsters, the zombie is not distant or detached, it is personal: a grotesque transformation of your past friends, family and lovers. To cope with the cognitive dissonance of the familiar becoming unfamiliar, movie protagonists usually take on one of two attitudes: identification or disidentification.

In the 2004 *Dawn of the Dead* remake, the characters of Andre and Steve personify these different approaches. Andre continuously identifies with his zombified wife, clinging to the monstrous baby she is birthing, while Steve completely disidentifies with the zombies, initiating a shooting game where they are the walking targets (1:12:00, 53:00). To take a stance between these two perspectives and acknowledge the zombies as existing between the boundaries of life and death would engender cognitive dissonance and threaten their established worldview (Clasen, 2010). The living dead confront us with the «brutal realities of mortality", appearing as the physical manifestation of our worst fears (Bishop, 2006, p. 198). Their decaying form symbolizes cultural anxieties, such as the losses of freedom, autonomy, agency and individuality (Tenga & Zimmerman, 2023). Slaves to their failing bodies, zombies are reflective of prominent fears related to themes of sickness, death and societal collapse. The graphic body horror in the final scene of the extended cut of *Dawn of the Dead* (1978), where zombies voraciously devour the entrails of one of the protagonists, perfectly encapsulate these fears of bodily corruption (2:07:04). In the film, not only are the victims losing their agency through the zombification process, but even the survivor succumbs to the terrors of the failing body.

Zombie movies also often showcase the worst aspects of humanity, blurring the lines between the monstrous and the human when protagonists are forced into making difficult decisions to survive. This is reflected in the physical infection spreading through the host, which acts as a metaphor for the repressed cultural fear of being the instigators of our own demise. Thus, the fear of the zombie is ultimately the fear of ourselves; their mass slaughtering in horror movies functions as a dehumanizing tool to broaden the gap between *Us* and *Them* (Cohen, 2012). In all three cases of cognitive dissonance, we choose to identify with the idea closest from us to avoid confrontation with what the alternative represents. In *Dawn of the Dead* (2004), Andre, a loving family man, continuously identifies with his

infant, refusing to recognize the monster in him and his wife, whereas Steve, a fortunate and egotistical all-American man, views the creatures the same way he views the working class: mindless and replaceable. For them to identify with the other would be to see the familiar in the unfamiliar, the alive in the dead, and the human in the monster.

In sum, the zombie's contradicting existence as both corpse and human places it within the depths of the uncanny valley. Positioned at the junction of the familiar and the strange, the undead reflect our unconscious fears through the faces of our loved ones. The terrifying nature of the monster resides in its mirror image of ourselves as the product of our downfall. Like a starved zombie with a human brain, the genre feasts on its zeitgeist to continuously evolve. ■

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THE GARDEN

AND ITS WALLS: A SOCIOCULTURAL ANALYSIS OF VANCOUVER'S DR. SUN YAT-SEN CLASSICAL CHINESE GARDEN

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ABSTRACT

This essay examines the Dr. Sun Yat-Sen Classical Chinese Garden in Vancouver through a sociocultural lens. Positioned in Chinatown within Vancouver's Downtown Eastside (DTES), the garden is the first authentic Ming Dynasty-style scholar's garden outside of China. Operating as both a public park managed by the Vancouver Park Board, as well as a paid garden managed by a nonprofit organization, the garden symbolizes an intersection of Canadian and Chinese cultures, offering a distinctive lens for analyzing cultural interplay. The concepts of the «contact zone» as well as assemblage theory are central to understanding the garden's role in facilitating cross-cultural dialogues. Influenced by scholars like James Clifford and Mary Louise Pratt, the garden serves as a physical and conceptual space where cultures converge, fostering interpersonal dialogue among visitors of varied backgrounds. Philipp Schorch's expansion of the contact zone to museum spaces offers a framework for analyzing the garden as representing Chinese culture in Vancouver as well as tying the garden to its locality. The analysis of the garden extends beyond its own confines and over its walls, exposing and exploring the complex relationship the garden has to its surrounding space, the DTES, and Chinatown.

Keywords: *human ecology, contact zone, assemblage theory, urban garden, sociocultural analysis.*

National Geographic chose the Dr. Sun Yat-Sen Classical Chinese Garden of Vancouver as the world's top city garden in 2011 (National Geographic, 2011, p. 286). Inspired by the classical Chinese gardens in Suzhou China, the garden was the first of its type outside of Asia. The garden, placed in Chinatown in the Downtown Eastside of Vancouver (DTES), consists of both a public park run by the city of Vancouver as well as a paid garden and indoor space run by the nonprofit organization sharing the same name (Hlavach, 2014; Liu, 1994). The interchange of Canadian and Chinese cultures and the concept of the "third space" and "contact zones" are integral points of analysis of the garden. The locale of the garden and its proximity to a large, unhoused community shows how the garden is more than its interior and that it interacts with both the geopolitics of the area and theories of assemblage. An assemblage, and assemblage theory, describes a collection of heterogeneous elements coming together to form a whole (Bennett, 2009, pp. 101-102). Elements of an assemblage may include people, objects, institutions, or practices. In the case of this garden, the assemblage may include, but is not limited to, where it is located (Chinatown and the DTES), the institution that runs the garden, as well as the aesthetics, cultural artifacts, and objects that make up the garden. This essay's analysis of the Dr. Sun Yat-Sen Classical Chinese Garden demonstrates how: (A) a botanical garden functions as a contact zone and dialogical space offering a cultural interplay, and (B) how looking beyond the wall of the garden exposes the geopolitics of the region and demonstrates assemblage theory.

Cultural Interplay

During the planning phases of the Dr. Sun Yat-Sen Classical Chinese Garden, or the Sun Yat-Sen Chinese Garden, it was explained that it "would not only showcase China's cultural legacy" but also "provide a way to bridge eastern and western cultures (Hlavach, 2014, p. 44). Utilizing authentic tools and construction techniques, the garden would come to be the first authentic Ming Dynasty-style scholar's garden to be constructed outside of China (p. 44). The garden opened just in time for Expo 86—the start of a global cultural interaction the garden was designed to represent. As Hlavach (2014) writes, there was a need to promote cultural dialogue in Vancouver, and "the Chinese are now the most visible minority" of the land (p. 45).

A *contact zone* refers to a social space in which cultures meet and interplay. James Clifford and Mary Louise Pratt have explored this concept in their works, which Philipp Schorch expands on. In the context of the garden, the contact zone is the physical or conceptual space where the Chinese culture interplays

with the Canadian culture. This contact zone is an enactment of cross-cultural dialogue moving beyond an abstract and theoretical concept, evolving into an "interpersonal dialogue among cultural human beings" (Schorch, 2013, p. 75), in which the visitor is a participant and actor. This *humanization* of culture and ongoing dialogue transforms the garden into a *Third Place*, a pluralistic space, that in Schorch's words "pays tribute to the inescapable pluralism from within" (p. 75).

Visitors to the garden of diverse backgrounds engage with the diversity of plants and structures in the garden and therefore promote a dialogical interplay between the many associated cultures. In theory, this promotes understanding, by presenting the histories and contexts of Chinese culture to the visitors who encounter the garden, therefore fulfilling a goal of promoting mutual respect and learning. Expanding upon this, the dialogical *third space* emphasizes the role of space as transcending the dichotomies of public and private, with the space serving as a background for communities coming together, interacting, and engaging in dialogue. This holds true for the Sun Yat-Sen Chinese Garden, as it promotes traditional and culturally important holidays, such as the recent Mid-Autumn Festival.

Over the Garden Walls

Looking over and beyond the walls of the garden is an essential aspect of understanding the larger geopolitical struggles of the garden's space and organization, as well as those of the Chinese community and DTES. The concept of the '*Other*' helps us understand how certain identities are articulated as differing from the prevailing 'norm' of society, such as the dominating identity of the White European in Canadian society. The dynamics of the Other are complex, and in Vancouver's Chinese garden, residents are exposed to the Other of Chinese culture. Through this exposing of culture, a larger understanding of Chinese culture, and therefore potential kinship and mutuality, may be achieved. Yet, how does the garden, which represents an Other, replicate these relations outside of its walls? I believe that the organization that runs the garden, although they may be well-intentioned, does not fully consider the geopolitics that exists over the garden walls.

In a Vancouver Sun article, Lorraine Lowe, a director of the garden, invites the community to the reopening of the garden post peak pandemic, during which the garden had closed its doors to visitors. Lowe (2021) advertises "improved security in the area," writing that "behind these white garden walls, usually tattered with random, artless, and incoherent graffiti, I sit in tranquility." The director's words hint towards the complexity of the area and perhaps at a lack of understanding of the DTES community. Much of the graffiti on the DTES is political, depicting movements of Indigenous sovereignty such as Land Back, addressing the garden of the city, as well as the crises of housing affordability and addiction. This situates the garden in a complex geopolitical arena, a cultural battleground, and an interplay of many cultures and ideologies. The thoughts by Lowe are also echoed in the Google reviews for the garden. After "Koi," "homeless" is the top-mentioned keyword in written Google reviews. *Homeless* is in fact mentioned more than the keywords *Chinatown*, *public park*, or *bonsai*, which all relate more to the garden itself. There are 29 mentions of homeless, with sentences from reviewers such as "there are many junkies and homeless" to "many homeless people [and] bad smell in the streets around the garden." One individual described many "blocks of drug-addicted souls" surrounding the walled garden, and another described the streets as being "infested with crime, homelessness and drugs," warning readers to "tread carefully" (Google, n.d.).

Tony Bennett (2009) writes on how a museum can function as a site of cultural display as well as *power*. Museums, and gardens, involve curating and exhibiting artifacts to provide a certain narrative. Drawing on concepts conceptualized by Foucault, there are two different modes in which forms of power act on population: Through the mechanism of the public and through the milieu (Bennett, 2009, p. 100). Bennett also utilizes assemblage theory, exploring how interactions of differing phenomena are formed through arrangements and interactions of various assemblages. This term encompasses heterogeneous elements, in which differing parts are bound to the whole, and the whole is bound up by its differing parts (Bennett, 2009).

The garden, then, is itself a literal assemblage, a collection of diverse plant species and architectural concepts originating from China. In applying assemblage theory, we gain a larger and more relational understanding of the complexities of the area beyond the garden walls as well. The contextual elements the garden exists in, specifically the social and political elements, are therefore extremely relevant to the geopolitics of the DTES when we consider how assemblage theory plays in. The visitor does not land in the garden by parachute, and their experience does not take place only within the garden walls. Rather, every visitor to the garden encounters the DTES, and therefore is an actor in a larger network, entangled within the complex relations and politics of the area.

Conclusion

Place cannot be ignored, and with the garden being situated where it is, place is embedded in the experience of every visitor, a key aspect that cannot be overlooked. The beautiful Dr. Sun Yat-Sen Classical Chinese Garden paints a picture of how a botanical and cultural garden can function as a *third place, contact zone*, and a dialogical interchange of culture. The garden is an intense depiction of assemblage theory, with many layers of interactions and relations. A rich interplay of cultures exists within this Chinese garden that offers a traditional aspect of Chinese culture in Canada, a relationship in which the diverse group of visitors offer their own backgrounds into the mix as well. Then, we look just beyond the walls of the garden and reflect on how the surrounding area plays into these relations as well, building a complex assemblage. The interior and exterior of the garden are intertwined. Applying assemblage theory and analyzing a space in such a way allows us to fully understand how place becomes so meaningful and rich. ■

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Cluster 3 —

LUCIDUS

Biology, chemistry and health

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OPTIMIZATION OF THE INTRODUCTION OF 2,6-DIMETHYLPHENOL AT THE C4-ATOM OF 2'-DEOXYTHYMIDINE FOR THE PREPARATION OF MODIFIED OLIGONUCLEOTIDES

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ABSTRACT

Nucleic acids, including DNA and RNA, are vital for genetic information storage and expression, finding applications in diverse fields. Chemical synthesis is commonly used for nucleic acid modification, utilizing protecting groups to selectively modify specific positions without disrupting the overall structure. This study focuses on optimizing the introduction of a 2,6-dimethylphenoxy group at the C4 position of a protected 2'-deoxythymidine, a modification for enhancing stability, binding affinity, and expanding chemical diversity for future applications in therapeutics, diagnostics, and nanomaterials. Silylation was used as the initial step for 2'-deoxythymidine protection, followed by the preparation of the modified nucleoside. Optimization of synthetic procedures involved adjustments of reaction parameters, such as solvent and reagent stoichiometry, using small- and large-scale reactions. Extensive experimentation revealed that changing the solvent from tetrahydrofuran to dichloromethane and using 1,8-diazabicyclo [5.4.0] undec-7-ene as the base provided significant progress in reaction efficiency. Analytical techniques, including thin-layer chromatography and 1H Nuclear Magnetic Resonance spectroscopy, were employed for monitoring and confirmation of compound identity and purity. Successful optimization of the synthetic protocol will contribute to nucleic acid modification chemistry advancement with potential applications in therapeutics or diagnostics.

Keywords: *Nucleosides, silylation, chromatography, NMR, optimization.*

Nucleic acids, such as DNA and RNA, play a critical role in storing and expressing genetic information, and their diverse applications in therapeutics, diagnostics, biochemical studies, and nanotechnology are well established (Chen et al., 2016; Hunter, 2017; Ochoa & Milam, 2020). Chemical synthesis techniques are used to expand the functionality of nucleic acids, with protecting groups used to selectively modify specific positions without altering the overall structure (Bols & Pedersen, 2017; Markiewicz & Wiewiórowski, 1978). These protecting groups act as temporary modifications that allow for precise alterations, conferring new properties such as enhanced stability, binding affinity, or specificity (Bols & Pedersen, 2017; Markiewicz & Wiewiórowski, 1978; Ochoa & Milam, 2020; Rodriguez et al., 2019). Ongoing research focuses on developing synthetic methodologies to broaden functional modifications while preserving the structural properties of nucleic acids (Ochoa & Milam, 2020; Rodriguez et al., 2019).

In this project, our objective is to optimize the introduction of a 2,6-dimethylphenoxy group at the C4 position of a protected 2'-deoxythymidine. This project focuses on optimizing the introduction of a 2,6-dimethylphenoxy group at the C4 position of a protected 2'-deoxythymidine. The successful completion of this project will enhance our understanding of nucleic acid modification chemistry and could lead to new applications in therapeutics and diagnostics.

The initial step involves protecting the 2'-deoxythymidine through a silylation reaction (Copp & Wilds, 2020). This reaction converts the hydroxyl group of 2'-deoxythymidine into a silyl ether, shielding it from unwanted side reactions. We treat 2'-deoxythymidine with trimethylsilyl chloride to form a silyl ether, ensuring that the hydroxyl group remains unreactive for subsequent transformations. Following this, the protected 2'-deoxythymidine is converted into a C4-(1,2,4-triazol-1-yl) convertible nucleoside. The reaction conditions are optimized using 2,6-dimethylphenol to achieve high yields of the desired product.

This optimization involved both small-scale and large-scale reactions. Small-scale reactions were performed in sample procedure bottles to fine-tune parameters such as solvent and reagent stoichiometry. The most effective conditions were then scaled up in a round bottom flask (RBF) to test their applicability on a larger scale.

To ensure the accuracy and quality of the synthesis, analytical techniques including thin-layer chromatography (TLC) and 1H Nuclear Magnetic Resonance (NMR) spectroscopy were employed. TLC was used to monitor reaction progress and assess product purity by comparing the migration of compounds on a stationary phase (Santiago & Strobel, 2013). NMR spectroscopy provided detailed information on the structure and purity of the synthesized compounds, offering insights

into their chemical composition (Lundquist, 1992). These comprehensive analytical techniques were employed to ensure the quality and integrity of the compounds throughout the optimization process.

Methods

The experiment began with the utilization of a silylation reaction method adapted from a published procedure (Copp & Wilds, 2020). A solution of 5'-O-4,4'-dimethoxytrityl-2'-deoxythymidine (1.5 g, 2.75 mmol), imidazole (0.38 g, 5.51 mmol), and 4-dimethylaminopyridine (DMAP, catalyst) in dichloromethane (DCM, 33 mL) was prepared, and tert-butyldimethylsilyl chloride (TBS-Cl, 0.83 g, 5.51 mmol) was added while stirring. After 18 hours, the solvent was removed in vacuo, and the crude colorless powder was dissolved in DCM (100 mL). The organic layer was washed with NaHCO3 (aq, 3% w/v) (2 x 35 mL), brine (1 x 35 mL), and then dried over anhydrous Na2SO4 (~4 g) before being decanted and having the solvent removed in vacuo. The crude compound was purified by silica gel flash column chromatography using a gradient of methanol (MeOH) in DCM (0 %, 0.5 %, 1 %, 1.5 %, 2 %), which produced 1.48 g (81.8 %) of a colorless powder. The Rf (SiO2, TLC) of this compound was 0.8 MeOH:DCM (5 %). The 1H NMR (300 MHz, CDCl3, ppm) showed signals at **δ** = −0.03 (s, 3H, CH3TBS), 0.03 (s, 3H, CH3TBS), 0.84 (s, 9H, t-BuTBS), 1.49 (d, J = 1.0 Hz, 3H, CH3T), 2.22 (app. dt, J = 13.3, 6.7 Hz, 1H, H-2'a), 2.33 (ddd, J = 13.3, 6.1, 3.5 Hz, 1H, H-2'b), 3.26 (dd, 1H, H-5'a), 3.47 (dd, 1H, H-5'b), 3.79 (s, 6H, 2 × OCH3), 3.96 (app. q, J = 2.8 Hz, 1H, H-4'), 4.52 (app. dt, J = 6.4, 3.5 Hz, 1H, H-3'), 6.35 (app. t, J = 6.6 Hz, 1H, H-1'), 6.82-6.84 (m, 4H, HAr), 7.22-7.26 (m, 1H, HAr), 7.29-7.32 (m, 6H, HAr), 7.40-7.42 (m, 2H, HAr), 7.65 (d, J = 1.0 Hz, 1H, H-6), 8-8.1 (s, 1H, NH-3) ppm. The Rf and 1H NMR data were consistent with the literature (Copp & Wilds, 2020).

Then, the protected nucleoside was converted to its triazole intermediate using a reaction method adapted from a published procedure (Wilds, 1999). Specifically, a solution of 5'-O-4,4'-dimethoxytrityl-3'-O-tert-butyldimethylsilyl-2'-deoxythymidine (1.25 g, 1.9 mmol) in DCM/acetonitrile (1:1, 20 mL) was stirred and treated with triethylamine (TEA, 2.884 g, 28.5 mmol), 1,2,4-triazole (2.362 g, 34.2 mmol), and POCl3 (0.583 g, 3.8 mmol). After one hour, TLC analysis confirmed complete conversion of the starting material to the triazole intermediate. The Rf (SiO2, TLC) was 0.2 with MeOH:DCM (5 %). The reaction was then diluted with DCM, washed with 2% NaHCO3, dried over anhydrous Na2SO4, filtered, and evaporated to dryness. The 1H NMR (300 MHz, CDCl3, ppm) showed signals at **δ** = −0.06 (s, 3H, CH3TBS), 0.004 (s, 3H, CH3TBS), 0.82 (s, 9H, t-BuTBS), 1.96 (s, 3H,CH3T), 2.2-2.3 (ddd, J = 14.6, 8.1, 6.9 Hz, 1H, H-2'a), 2.6-2.7 (ddd, J = 14.6, 7.7, 4.25 Hz, 1H, H-2'b), 3.32 (dd, J = 10.6, 2.8 Hz, 1H, H-5'a), 3.59 (dd, J = 10.6, 2.8 Hz, 1H, H-5'b), 3.79 (s, 6H, 2 × OCH3), 4.08 (app. q, J = 4.51 Hz, 1H, H-4'), 4.5 (app. dt, J = 4.51 Hz, 1H, H-3'), 6.3 (app. t, J = 6.9 Hz, 1H, H-1'), 6.83 (m, 4H, HAr), 7.25-7.26 (m, 1H, HAr), 7.27 (m, 6H, HAr), 7.39-7.4 (m, 2H, HAr), 8.09 (s, 1H, H-6), 8.44 (s, 1H, HTri), 9.29 (s, 1H, HTri). The TLC and 1H NMR data were consistent with the literature (Wilds, 1999).

After completing the silylation (Figure A2; Bols & Pedersen, 2017; Copp & Wilds, 2020; Markiewicz & Wiewiórowski, 1978) and the convertible nucleoside procedure (Figure A3; Allerson et al, 1997; Wilds, 1999), optimization of the method to introduce the 2,6-dimethylphenoxy group at the C4 position was performed on both small and large scales. Silicycle Aluminum backed TLC plates (TLA-R10011B-323) were used to monitor the reaction progress. For both small- and large-scale optimizations, the mixtures were stirred at room temperature using the VWR Dylastir magnetic stirrer on a hotplate, employing magnetic stir bars. The evaporation steps were carried out using an IKA RV 10 rotary evaporator.

For the small-scale reaction optimization, 3 mL sample procedure bottles were used. Different amounts of starting material, 5'-O-dimethoxytrityl-3'-O-tert-butyldimethylsilyl-C4-triazolyl-2'-deoxythymidine (1), and reagents were mixed in each bottle.

In Method A, Bottle 1, 20.5 mg of 1 (1 equivalent) was mixed with 0.3 mL of tetrahydrofuran (THF), 10.67 µl of TEA (2.5 equivalents), and 0.009 g of 2,6-xylenol (2.5 equivalents) (Table A1; Figure A4). Bottles 2, 3, and 4 contained varying amounts of starting material compound 1 (20.1 mg, 20.4 mg, 20.1 mg, respectively) with different equivalents of TEA and 2,6-dimethylphenol (5/5, 5/2.5, 2.5/5, respectively) (Table A1; Figure A4). TLC was employed to monitor the reaction progress, utilizing a mobile phase of 0.5% MeOH in DCM. Reaction progress was evaluated by comparing the mobility of the products with the starting material. Aliquots were removed and analyzed by TLC at initiation, one hour and eighteen-hour reaction times (Figure 1; Figure A1).

For the next series of reactions, the base was changed to 1,8-diazabicyclo [5.4.0] undec-7-ene (DBU).

In Method B, Bottle 1, the reaction mixture contained 20.3 mg of 1, 0.3 mL of tetrahydrofuran (THF), 10.78 µl of DBU (2.5 equivalents), and 0.009 g of 2,6-dimethylphenol (2.5 equivalents), while Bottles 2, 3, and 4 contained different amounts of 1 (20 mg, 20.2 mg, 19.9 mg, respectively) and varying equivalents of DBU and 2,6-dimethylphenol (5/5, 5/2.5, 2.5/5, respectively) (Table A1; Figure A4). TLC was used to monitor the reaction progress using a solvent mixture of 0.5% and 1% MeOH in DCM. Aliquots were removed and analyzed by TLC at initiation, one-, two- and twenty-hour reaction times (Figure 1; Figure A1).

In the subsequent study, Method C, the volume of THF was changed to 1 mL, while keeping the other reagents unchanged. In one procedure, 20.2 mg of 1, 1 mL of THF, 10.67 µl of TEA (2.5 equivalents), and 0.0181 g of 2,6-dimethylphenol (5 equivalents) was used. For another reaction, the amount of DBU was reduced to 8.82 µl (2 equivalents) with other reagents unchanged (Table A1; Figure A4). TLC was performed to monitor the progress of the reaction using a solvent mixture of 1% MeOH in DCM. Aliquots were removed and analyzed by TLC at initiation and 5-minute reaction times (Figure 1; Figure A1).

Next, in Method D, we changed the order of reagent addition, where 19.6 mg of 1 (1 equivalent) was mixed with 1 mL of THF, 0.0183 g of 2,6-dimethylphenol (5 equivalents), and 8.82 µl of DBU (2 equivalents) (Table A1; Figure A4). Using 1% MeOH in DCM as a solvent mixture, TLC was used to monitor the progress of the reaction. Aliquots were removed and analyzed by TLC at initiation, 5- and 10-minute reaction times (Figure 1; Figure A1).

For the final small-scale optimization reaction, Method E, the solvent was changed to DCM. This reaction mixture now contained 19.3 mg of 1, 1 mL of DCM, 0.0180 g of 2,6-dimethylphenol (5 equivalents), and 8.82 µl of DBU (2 equivalents) (Table A1; Figure A4). The reaction was monitored by TLC with a solvent system of 1% and 2% MeOH in DCM to evaluate the progress of the reaction. Aliquots were removed and analyzed by TLC at initiation, 5 and 10 minute and 24-hour reaction times (Figure 1; Figure A1).

Following, in Method F, the optimization procedure was performed on a larger scale using a RBF. To a 50 mL RBF was added 180 mg of compound 1 which was dissolved in 4 mL of DCM (Table A1; Figure A4). To this, 75 µl of DBU and 150 mg of 2,6-dimethylphenol were added (Table A1; Figure A4). The mixture was subsequently diluted with 1.25 mL of DCM, and TLC was performed using a solvent system of 2% MeOH in DCM to monitor the reaction progress. Aliquots were removed and analyzed by TLC at initiation, 30 and 50 minutes and 2-hour reaction times (Figure 1; Figure A1).

The reaction was worked up by removing the solvent by rotary evaporation and dissolving the crude in 50 mL of DCM. The mixture was transferred to a separatory funnel9 and subjected to two washes with an equal volume of 3% NaHCO3 in water, followed by a single wash with saturated NaCl in water. The organic layer was collected and dried over Na2SO4. The solvent was filtered and evaporated at 23 °C to obtain a crude product for column chromatography. The column was initially packed with silica gel and equilibrated with 100% DCM. The crude reaction mixture was dissolved in a small volume of DCM, and the solution was loaded onto the column. The desired compound was eluted from the column using a 0 - 0.5 % v/v gradient of MeOH in DCM. Fractions of eluent were collected, and the purity of each fraction was monitored by TLC. In order to obtain a purified compound, fractions containing the desired product were combined, and the solvent was evaporated at 23 °C. The compound was characterized by 1D 1H NMR spectroscopy using a Bruker FOURIER-300MHz NMR instrument (Figure 2).

Results

Small-scale optimization reactions were performed using different solvents, bases, volumes of THF, and reagent equivalents to investigate the optimal conditions for the optimization of the introduction of a 2,6-dimethylphenoxy group at the C4 position of a protected 2'-deoxythymidine nucleoside. TLC was used to monitor the progress of the reactions.

Initially, reactions were conducted using THF as the solvent with varying amounts of starting material, bases (TEA or DBU), and 2,6-dimethylphenol. TLC analysis revealed no significant progress, as the starting material remained predominant on the plates, with no new product spots appearing even after eighteen to twenty hours of stirring. This consistent observation across all TLC plates indicated that THF was ineffective in driving the reaction, regardless of the variations in base and reagent quantities (Figure 1; Table 1). Next, the effects of changing the volume of THF and the order of reagent addition were investigated. Increasing THF volume to 1 mL from 0.3 mL, and reducing DBU to 2 equivalents, did not result in a significant advancement of the reaction (Figure 1; Table 1). Additionally, changing the order of reagent addition did not improve the reaction outcome. (Figure 1; Table 1).

To further investigate reaction optimization, the solvent was changed from THF to DCM. TLC analysis of the reaction using DBU as the base and a high concentration of nucleophile to base revealed a conclusive formation of a new product within twenty-four hours (Figure 1; Table 1; Table A2). A larger scale version of the reaction was carried out using a RBF setup. As indicated by TLC, the reaction progressed significantly within two hours of stirring at room temperature (Figure 1; Table 1). There were also new peaks in the 1H NMR spectrum of the reaction product, including one between 1.70-1.72 ppm for the C5-methyl group, and two between 2.08-2.17 for the 2,6-dimethylphenoxy methyl groups, confirming formation of the desired product (Figure 2).

Table 1. *Summary of the conditions and outcomes for the reactions investigated for optimizing the introduction of the 2,6-dimethylphenoxy group at the C4 position of a protected 2'-deoxythymidine.*

Method	Solvent	Base	Time	Temperature	Results
A	THF	TEA	18 hours	23 °C	inconclusive
B	THF	DBU	20 hours	23 °C	inconclusive
C	THF	DBU	5 minutes	23 °C	inconclusive
D	THF	DBU	10 minutes	23 °C	inconclusive
E	DCM	DBU	24 hours	23 °C	conclusive
F	DCM	DBU	2 hours	23 °C	conclusive

Table A1. *Reagents for small scale optimization procedure.*

Method	Reagent	Molecular Weight (g/mol)	Mass (g)	mmol	Equivalents	Density (g/cm^3)
A-E	5'-O-dimethoxytrityl-3'-O-*tert*-butyldimethylsilyl-C4-triazolyl-2'-deoxythymidine	709.91	0.02	0.03	1	
A, B, C	2,6-dimethylphenol	122.16	0.009	0.075	2.5	
A-E	2,6-dimethylphenol	122.16	0.018	0.15	5	
A	TEA	101.19	0.0076	0.075	2.5	0.712
A	TEA	101.19	0.015	0.15	5	0.712
C, D, E	DBU	152.24	0.009	0.06	2	1.02
B, C	DBU	152.24	0.011	0.075	2.5	1.02
B	DBU	152.24	0.023	0.15	5	1.02
E	Product	763.02	0.023	0.03	1	

Table A2. *Reagents for the large-scale optimization procedure.*

Reagent	Molecular Weight (g/mol)	Mass (g)	mmol	Equivalents	Density (g/cm^3)
5'-O-dimethoxytrityl-3'-O-*tert*-butyldimethylsilyl-C4-triazolyl-2'-deoxythymidine	709.91	0.180	0.25	1	
DBU	152.24	0.076	0.5	2	0.712
2,6-dimethylphenol	122.16	0.153	1.25	5	

Figure 1. *TLC analysis of Methods A-F: sequential order of TLC plates from left to right.*

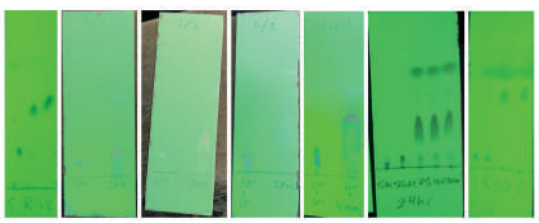

Figure A1. *TLC plates in order of optimization procedure: Methods A-F, presented from left to right.*

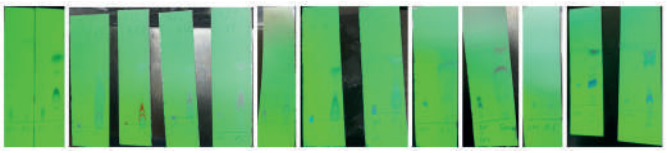

Figure 2. *^{1}H NMR spectrum of the product employing Method F.*

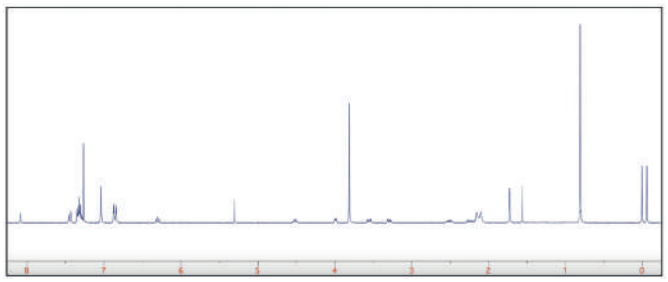

Figure A2. *^{1}H NMR spectrum of the silylation reaction procedure product.*

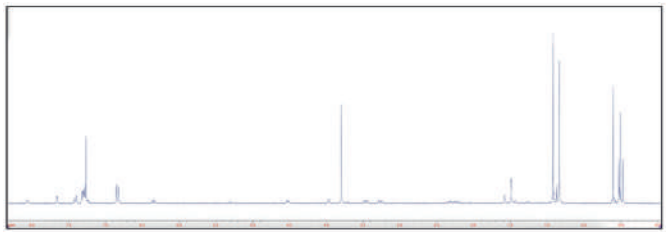

Figure A3. *^{1}H NMR spectrum of the convertible nucleoside procedure product.*

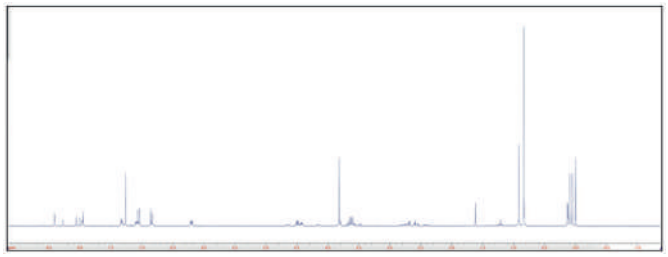

Figure A4. *Sample calculations for volumes, moles and mass.*

Volume (solvent): n (moles)/concentration
Volume (base): Mass/density
*Mass: molecular weight * n*
*n : n of starting material * equivalents*

Discussion

The optimization of chemical reactions is a crucial step in organic synthesis, as it allows for the identification of optimal conditions that can lead to improved yields, selectivity, and efficiency. In this study, we aimed to optimize the introduction of a 2,6-dimethylphenoxy group at the C4 position of a protected 2'-deoxythymidine through deprotonation of 2,6-dimethylphenol and subsequent nucleophilic attack. The extensive experimentation with different solvents, bases, volumes of THF, and reagent equivalents provided valuable insights into identification of the optimal conditions for the reaction.

The initial attempts with THF as the solvent did not yield significant progress in the reaction, despite variations in base, equivalents, and THF volume. This lack of progress raised questions about the effectiveness of THF for this particular reaction. The TLC results indicated that the reaction did not show significant progress even after eighteen or twenty hours of stirring, regardless of the changes in base from TEA to DBU and its equivalents, and the volume of THF used. This led us to explore other solvents that could potentially be more suitable for the reaction.

In an effort to improve the reaction progress, we decided to change the solvent from THF to DCM. To our delight, the reaction showed the product formed within twenty-four hours of stirring when DBU was used as the base in DCM, as indicated by TLC (Figure 1). This improvement in reaction progress was encouraging, and it suggested that DCM is a more suitable solvent for the reaction compared to THF. The change in solvent appeared to have a profound impact on the reaction, indicating that the nature and properties of the solvent can influence the reaction efficiency (Byrne et al., 2016).

The choice of base was also found to be a critical factor in the process. The use of different bases such as TEA or DBU, and varying their equivalents, did not result in observable progress in the reaction when THF was used as the solvent. However, when DBU was used as the base in DCM, the reaction showed notable advancement. This result suggested that DBU is a more effective base compared to TEA for this reaction. The change in base appeared to influence the reaction progress, possibly by affecting the deprotonation step, nucleophilic attack, or intermediate stabilization (Liu et al., 2020).

Moreover, a higher concentration of nucleophile compared to base yielded better results due to deprotonation, where 2,6-dimethylphenol is deprotonated by the base to generate the active nucleophile (Chyall et al., 1994). Higher nucleophile concentration increases the likelihood of nucleophile-nucleobase collisions, leading to an improved reaction rate. The optimization efforts were further validated by scaling up the reaction using a RBF setup. TLC indicated that the reaction progressed appreciably within two hours of stirring at room temperature, and the 1H NMR spectra of the reaction product showed the appearance of new peaks, confirming conclusive results (Figure 1; Figure 2).

In conclusion, the study successfully optimized the reaction conditions for the introduction of a 2,6-dimethylphenoxy group at the C4 position of 5'-O-dimethoxytrityl-3'-O-tert-butyldimethylsilyl-C4-triazolyl-2'-deoxythymidine (1) by changing the solvent from THF to DCM, using DBU as the base, and increasing the nucleophile concentration relative to the nucleobase. The successful translation of the optimized conditions to a larger scale reaction indicates the potential for practical applications of the reaction. Going forward with these protecting groups, new reagents and conditions can be employed in synthesis to further expand the scope of reactions that can be used. The use of different protecting groups or modifications to the existing protecting group strategy can provide opportunities for diversifying the product library and tailoring the synthesis to specific needs. ■

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COMPUTATIONAL ANALYSIS OF DINUCLEOSIDE MONOPHOSPHATES

COMPARING STRUCTURAL PROPERTIES OF ANALOGOUS STRANDS OF DEOXYRIBONUCLEIC ACIDS AND RIBONUCLEIC ACIDS USING QUANTUM DENSITY FUNCTIONAL CALCULATIONS

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ABSTRACT

The objective of this experiment was to determine the relative stabilities of dinucleoside monophosphates using density functional theory calculations. The calculations performed used Gaussian16 density functionals (Frisch et al., 2014) and Schrödinger's equation to determine the optimal structure of single strands of two-base long deoxyribonucleic acids and their analogous ribonucleic acids. The strands looked at were composed of, respectively, deoxyadenosine-deoxycytidine, and deoxyguanosine-deoxythymidine for the DNA strands. The RNA strands were composed of, respectively, adenosine-cytosine, guanine-uracil, and guanine-thymine. The Hartree-Fock energies of the DNA AC and GT strands as well as those of the RNA AC, GT, and GU strands respectively were of -9.5672 x10-15 J, -1.0153 x10-14 J, -1.0223 x10-14 J, -1.0809 x10-14 J, and -1.0638 x10-14 J. Each of these were determined using Gaussian16 with the wB97X-D/6-31+G(d,p) model and tabulated using AIMAll (AIMSum, 2019). These values show that the RNA strands are more stable than the DNA strands with the adenosine-containing strands being the least stable in both the DNA and RNA forms respectively.

Keywords: *Biophysics, Chemistry, Quantum Mechanics, Nucleic Acids, Computational Biophysics.*

Advancements in nucleic acid research are critical for the development of drug treatments, cancer research, and even less common fields such as DNA computing and DNA storage. Understanding the structure of nucleic acids is critical to pursue such advancements. The objective of this research project is to determine an easy and rapid method to determine the relative stability of nucleic acid molecules through empirical means. Development of such a method would allow future research to easily synthesize nucleic acid molecules for genetic engineering or medical purposes while ensuring these molecules will be stable enough to be usable for their desired purpose without wasting precious materials due to trial and error. This experiment is the first step in this research project.

Density functional theory is an *ab initio* quantum modeling method used to determine the interactions in many-body systems which can be made of atoms, molecules, or a combination of both. Many different properties of a system can be calculated using DFT including optimized geometry, vibrational frequencies, ground-state energy, electronic forces, etc. The model calculates these parameters using functionals of the Schrödinger equation or Schrödinger-like equations to map out an electron density topographical chart which can be analyzed by computational methods to determine the various parameters required.

This model is interesting when looking at complex biological systems involving multiple molecules and different types of interactions between the many-body systems or within a single many-body system such as a single molecule for example. These systems can have covalent bonds, ionic bonds, Van Der Waal's interactions, London dispersion forces, hydrogen bonding, etc. Due to all of these interactions being possible within a single molecule, using super-computers capable of calculating multiple different parameters at the same time and repeating these calculations with small variations using machine-learning are imperative. A basic geometry optimization can take well over 24 hours to be completed when calculated using 8 central processing units (CPU), but the same calculation using a single CPU can take over 19 days.

The calculations completed for this experiment used the Gaussian16 model to determine 3 factors. The first is the geometry optimization. This step is crucial in this type of experiment since the objective is to compare different strands in their most stable forms. To determine the most stable geometry of a molecule or molecule system, an algorithm will make small changes to bond length, bond angle, dihedral angle, and distance between bodies in the system whether bound or not. These small changes will change the overall energy level of the system, and the algorithm will continue to make these changes until an inflection point is found. It ensures an inflection point is found using 4 different thresholds for the maximum force, RMS force, maximum displacement, and RMS displacement. If the calculated values for each of these values are below their respective thresholds, convergence is complete, and a stationary point is found.

To differentiate between maximum and minimum energy Inflection points, a vibrational frequency calculation is performed in which all possible vibrations of the

system are determined, along with the wavenumber (cm^{-1}), for each vibration. If the inflection point is a maximum, the lowest wavenumber value will be negative. If such a case occurs, the system must be modified in a way that does not affect the chemistry but can affects the physics of the system. Such a change can be done by changing the binding of a group on a molecule from *cis* to *trans* but without affecting chiral centers since changing the binding on a chiral center can drastically affect the chemical properties of a molecule.

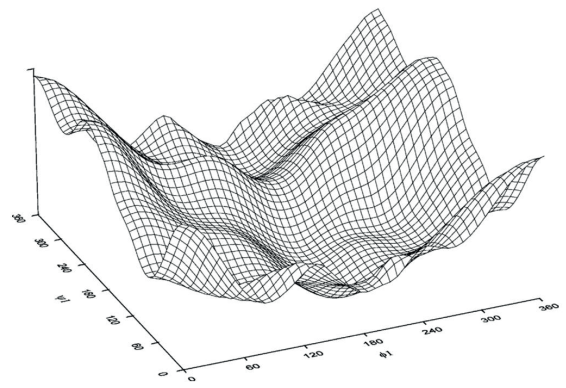
The optimized geometry's overall energy is also determined during geometry optimization through the potential energy surface of the system, determined from the Guaussian16 model. This is done through the Hartree-Fock (HF) equation which will always yield a negative value for the energy in units of Hartree. The equation is a functional of the Schrödinger equation in which an N many-body system is turned into an N single-particle HF equations through electron decoupling. This yields N different equations with N being equal to the number of particles or atoms in the case of molecules. The equation can be seen in Equation 1 for the ith electron.

A potential energy surface (Figure 1) plots the energy of a system based on the coordinates of the nuclei that make up that system. In simpler terms, it plots molecular energy vs molecular geometry. It would seem logical to plot the molecular energy as a function of electron coordinates instead of the nuclei coordinates, but due to the Born-Oppenheimer approximation (Born & Oppenheimer, 1927), plotting the nuclei coordinates allows us to simply solve the electronic Schrödinger equation and add the electronic energy to the internuclear repulsion to determine the overall total molecular energy of a system.

Equation 1. *Hartree-Fock equation.*

$$-\frac{\hbar^2}{2m}\nabla^2\psi_i(r) + V_{nucleus}(r)\psi_i(r) + V_{electron}(r)\psi_i(r) - \sum_j \int dx' \frac{\psi_j^*(r')\psi_i^*(r')\psi_j(r)}{|r-r'|} = \epsilon_i\psi_i(r)$$

Figure 1. *Typical Potential Energy.*



Once the optimized geometries calculated were asserted as minima, another calculation is performed to determine the orbitals present in the system. These orbitals can be bonding, non-bonding, or anti-bonding and determined through Schrödinger's equation. It is important to note that Schrödinger's equation is only exact for a one-electron system and becomes only an approximation when more than 1 electron are present. This still remains the most accurate calculation currently available. Once the orbitals are determined, the wavefunction of the system is calculated and used to determine the exact bond paths and visualize the topographical electron density chart.

The final step of this experiment was to calculate the exact bond critical points to determine the exact bond paths of each molecule analyzed. This was done using AIMAll for the calculations and AIMStudio for the visualization of the results. Using the results of these calculations of the wavefunction, it becomes easy to identify exactly which type of interaction is occurring between two atoms or groups of atoms and picture the orbital interaction itself. AIMAll takes the wavefunction calculated using Gaussian16 and then calculates the exact electron density function to determine the path of each interaction as well as their relative strength.

Methods

The model used for the Gaussian16 calculations was wB97X-D/6-31+G(d,p) which is a long-range corrected method with a medium-size basis set and is quite good for modeling non-covalent interactions (Chai & Head-Gordon, 2008).

The first step is to determine the optimized geometry using Gaussian16. Once the ideal equilibrium structure of each molecule was calculated, the vibrational frequencies of each molecule were calculated to ensure the stationary point found for each molecule is indeed an energy minimum and not a maximum. If the inflection point found is a maximum, one of its vibrational frequencies is a negative value, in wavenumber. If this was the case, the molecule was adjusted by changing the structural isomer and/or changing the bonding of the chiral center. The process is then repeated until an energy minimum is found.

Figure 2. *Line Drawing of the Single DNA Strands Analyzed.*

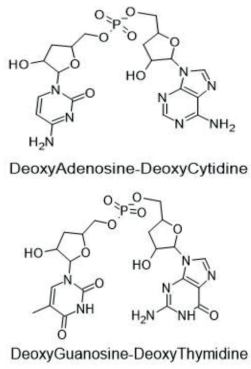
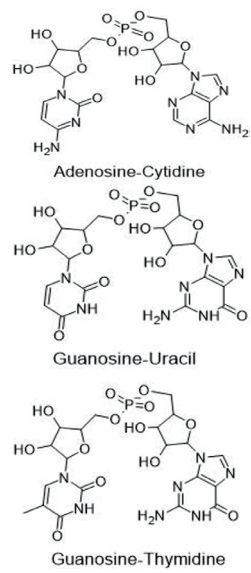


Figure 3. *Line Drawing of the RNA Strands Analyzed.*



Once the optimized structure of each molecule was established, two more calculations were performed using Gaussian theory and Schrödinger's equation to determine the molecular orbitals of each molecule involved in the bonding, non-bonding, and non-covalent interactions of each molecule including the hydrogen bonding.

The analysis of the specific bond-paths was done using AIMAll for the calculation of the bond critical points and AIMStudio to visualize them (AIMSum, 2019). The focus of this experiment was on the hydrogen bonding and how much stability these interactions conferred to each structure relative to their counterparts.

Results

Table 1. *Energy level of the various analyzed molecules*

Unit	# of Atoms	Hartree-Fock Energy (Joule)
DNA AC	61	-9.5672e-15
DNA GT	64	-1.0153e-14
RNA AC	63	-1.0223e-14
RNA GT	66	-1.0809e-14
RNA GU	63	-1.0638e-14

Figure 4a. *DFT Critical Points of the optimized geometry of the DNA AC strand*

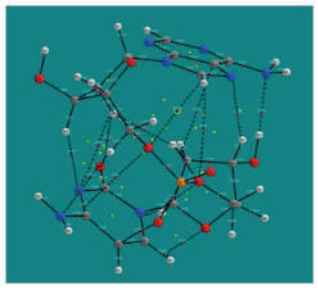


Figure 4b. *DFT Critical Points of the optimized geometry of the DNA GT strand*

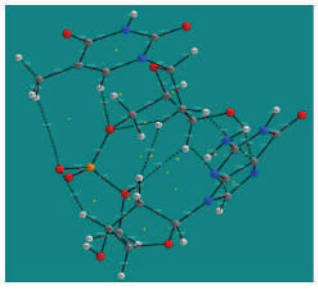


Figure 4c. *DFT Critical Points of the optimized geometry of the RNA AC strand*

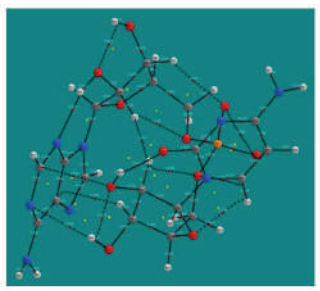


Figure 4d. *DFT Critical Points of the optimized geometry of the RNA GT strand*

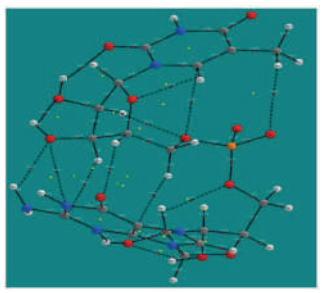


Figure 4e. *DFT Critical Points of the optimized geometry of the RNA GU strand*

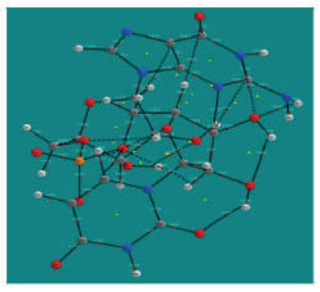


Table 2a. *Non-covalent Interactions Bond-Critical Points of the DNA AC strand*

H-Bonds				
Name	Atoms	Rho	E (kcal/mol)	Group
BCP42	O34 - H48	0.013255	0.0894	C-H -- O
	N16 -			C-H --
BCP50	H43	0.013308	0.0898	N
BCP51	N19 - H50	0.022515	0.152	O-H -- N
BCP67	H28 - N55	0.009268	0.0625	C-H -- N
BCP68	H30 - O56	0.006161	0.0416	C-H -- O
BCP78	H7 - N59	0.00322	0.0217	C-H -- N

Pseudo H-Bonds				
Name	Atoms	Rho	E (kcal/mol)	Group
BCP64	O40 - H53	0.02277	0.154	C-H -- O
BCP66	H30 - N55	0.006061	0.0409	C-H -- N

Other Non-Covalent BCP				
Name	Atoms	Rho	E (kcal/mol)	Group
BCP10	O4 - C14	0.006206	0.0419	O -- C
BCP58	O34 - N47	0.013743	0.0927	O -- N
BCP71	O4 - C58	0.00573	0.0387	O -- C

Table 2b. *Non-covalent Interactions Bond-Critical Points of the DNA GT strand*

H-Bonds				
Name	Atoms	Rho	E (kcal/mol)	Group
BCP13	H31 - H48	0.006606	0.0446	C-H -- H-C
BCP24	C17 - H49	0.010405	0.0702	C-H -- C (Pi)
BCP35	O2 - H29	0.011394	0.0769	C-H -- O
BCP50	C14 - H43	0.007656	0.0517	C-H -- C (Pi)
BCP51	N16 - H50	0.021905	0.148	O-H -- N
BCP62	O2 - H60	0.002311	0.0156	C-H -- O
BCP63	O34 - H53	0.013665	0.0922	C-H -- O

Pseudo H-Bonds				
Name	Atoms	Rho	E (kcal/mol)	Group
BCP5	O4 - H31	0.008487	0.0573	C-H -- O
	O34 -	0.00771		
BCP41	H48	4	0.0521	C-H -- O
BCP49	O4 - H43	0.006143	0.0415	C-H -- O

Table 2c. *Non-covalent Interactions Bond-Critical Points of the RNA AC strand*

H-Bonds				
Name	Atoms	Rho	E (kcal/mol)	Group
BCP5	O4 - H30	0.010306	0.0695	C-H -- O
BCP22	C17 - H43	0.009873	0.0666	C-H -- C (Pi)
BCP33	O2 - H28	0.009263	0.0625	C-H -- O
BCP39	N25 - H32	0.031184	0.210	O-H -- N (covalent character)
BCP44	O34 - H48	0.010801	0.0729	C-H -- O
BCP71	H53 - O57	0.03191	0.215	O-H -- O (covalent character)

Pseudo H-Bonds				
Name	Atoms	Rho	E (kcal/mol)	Group
BCP37	H30 - H48	0.00237	0.0160	C-H -- H-C
BCP41	O31 - H63	0.020505	0.138	O-H -- O
BCP61	O40 - H54	0.019648	0.133	C-H -- O
BCP65	O49 - H50	0.021966	0.148	O-H -- O

Other Non-Covalent BCP				
Name	Atoms	Rho	E (kcal/mol)	Group
BCP30	C23 - O49	0.006331	0.0427	O -- C (Pi)
BCP52	N22 - O45	0.007593	0.0512	O -- N (Pi)
BCP59	O2 - C55	0.002918	0.0197	O -- C (Pi)
BCP60	O34 - C51	0.008097	0.0546	O -- C (Pi)

Table 2d. *Non-covalent Interactions Bond-Critical Points of the RNA GT strand*

H-Bonds				
Name	Atoms	Rho	E (kcal/mol)	Group
BCP9	O4 - H31	0.013955	0.0942	C-H -- O
BCP19	C17 - H38	0.011707	0.0790	C-H -- C (Pi)
BCP28	C22 - H44	0.007705	0.0520	C-H -- C (Pi)
BCP36	N26 - H33	0.025662	0.173	O-H -- N
BCP46	O19 - H40	0.005564	0.0375	C-H -- O
BCP52	H24 - O46	0.013077	0.0882	N-H -- O
BCP54	O35 - H49	0.011603	0.0783	C-H -- O
BCP57	O50 - H51	0.028183	0.190	O-H -- O

Pseudo H-Bonds				
Name	Atoms	Rho	E (kcal/mol)	Group
BCP50	O41 - H55	0.018653	0.126	C-H -- O

Other Non-Covalent BCP				
Name	Atoms	Rho	E (kcal/mol)	Group
BCP41	O32 - O34	0.018484	0.125	O -- O
BCP48	N20 - O46	0.009311	0.0628	N -- O
BCP62	O35 - C52	0.008261	0.0557	C -- O
BCP80	O3 - C63	0.003838	0.0259	C -- O

Table 2e. *Non-covalent Interactions Bond-Critical Points of the RNA GU strand*

H-Bonds				
Name	Atoms	Rho	E (kcal/mol)	Group
BCP9	O4 - H31	0.013969	0.0943	C-H -- O
BCP17	C17 - H38	0.011454	0.0773	C-H -- C (Pi)
BCP28	C22 - H44	0.007586	0.0512	C-H -- C (Pi)
BCP36	N26 - H33	0.025775	0.174	O-H -- N
BCP46	O19 - H40	0.005564	0.0375	C-H -- O
BCP52	H24 - O46	0.012554	0.0847	N-H -- O
BCP56	O35 - H49	0.011533	0.0778	C-H -- O
BCP66	O50 - H51	0.028609	0.193	O-H -- O
BCP70	H54 - O58	0.026784	0.181	O-H -- O

Pseudo H-Bonds				
Name	Atoms	Rho	E (kcal/mol)	Group
BCP50	O41 - H55	0.018656	0.126	C-H -- O

Other Non-Covalent BCP				
Name	Atoms	Rho	E (kcal/mol)	Group
BCP41	O32 - O34	0.018562	0.125	O -- O
BCP47	N20 - O46	0.009419	0.0636	O -- N
BCP61	O35 - C52	0.00765	0.0516	C -- O

Discussion

The purpose of this experiment was to determine the stability conferring potential of hydrogen bonds and other non-covalent interactions in DNA and RNA using computational calculations on analogous strands of both types of molecules for comparison. The molecules have only been analyzed in single strands and thus only analyzed for intramolecular interactions. As such, the concept of B, A, and Z DNA forms is not involved in the current analysis. Quantum analysis of larger systems, such as a B-DNA dimer, becomes very difficult to do and will usually be analyzed using molecular dynamics, another computational method which uses classical physics rather than quantum physics. While these larger systems are possible to analyze using quantum methods, the cost to do so is very high with currently available DFT models (Poltev et al., 2009).

The results were obtained using QTAIM (Bader, 1990) which analyses the electron density topographically and characterizes each bond-path as a saddle point in the electron density topography. As such, the presented molecular graphs (Figure 4) do not show characteristics such as double bonds. The bond paths only show in which area the electrons travel between atoms and not which or how many orbitals are involved in the actual bonding. For specific bond orbitals, refer to the supplemental information.

The results obtained show that in single strand form, RNA is more stable than its analogous DNA single strand as is shown in Table 1. It also looks as though the strands which have guanosine as the purine also show more stability than the adenosine strands. This occurs in both DNA and RNA forms with the RNA Guanosine-Thymidine strand being the most stable of the five strands analyzed, and the DNA deoxyadenosine-deoxycytidine strand being the least stable. This can be explained from the structure of adenosine and guanosine as adenosine has only an amine group at position 6 while guanosine has an amine group at position 2 and a carbonyl group at position 6. This allows guanosine to hydrogen-bond through its carbonyl at position 6 as a hydrogen bond acceptor, while still having the same potential for both hydrogen bond acceptance and donation from its amine groups at position 2 as the amine group of adenosine at position 6.

The pyrimidines used however do not have very different hydrogen-binding potentials from one-another.

The major difference between the two in terms of hydrogen bonding potential is that the cytidine has an amine group at position 4, while the thymidine has a carbonyl group at position 4. This allows cytosine to both accept and donate hydrogen-bonds from its amine group while thymidine can only accept hydrogen bonds from its carbonyl group. There is also the methyl group at position 5 on the thymidine to consider. Although a methyl group generally is not involved in hydrogen bonding, a C-H bond can sometimes act as a hydrogen-bond donor when in proximity to a strong hydrogen bond acceptor as is seen in Table 2b. There is a hydrogen bond between oxygen 2 and hydrogen 60, the later being a hydrogen from the methyl group at position 5 on the cytidine. The interacting groups are the phosphodiester and the methyl in which we see a C-H – O hydrogen bond of 0.015595321 kcal/mol. This hydrogen bond is rather weak but can still not be ignored as it does confer some stability to the overall molecule.

Another unusual hydrogen bond type of interaction occurs in every single strand analyzed except the DNA AC strand. This interaction is a hydrogen bond donation into an aromatic pi-system. These interactions occurs when a C-H donates into an aromatic pi-system making a C-H – C hydrogen bond type of interaction. These interactions are also weak bonds; however, they add up when enough of them are present. Since this analysis is at the quantum level, they cannot be ignored even in small quantities.

An interesting result obtained is the RNA GT strand being more stable than the RNA GU strand. RNA in nature does not appear with thymidine but with uracil instead. The only difference in structure between the two is that uracil does not have a substituent at position 5 while thymidine has a methyl group. As per the comparison of thymidine and cytosine, the same logic applies between thymidine and uracil. The methyl group should be capable of hydrogen bonding with the phosphodiester oxygen, however, what was observed is not a hydrogen bond, but a non-covalent interaction between the phosphodiester oxygen and the carbon of the methyl group in a C – O electron donation. At only 0.0259 kcal/mol however, this bond is extremely weak, and the higher stability of the GT strand is most likely due to the overall structure of the molecule and as more bases are added, the methyl group may cause steric hindrance on the other groups causing the 3D-structure to be less stable as it becomes bigger. Thymine has also been found to be a more stable base than uracil by Ganyecz A. et al. (2019) and is known to be more resistant to photochemical mutations (Lesk, 1969).

The results obtained are thus on par with literature data. Overall, there are 16 different types of dinucleoside monophosphates for DNA, and only 2 of those were looked at in this experiment. The study may be expanded to all 16 and the same for every RNA DMPs. It has also been found by Poltev et al. (2009) that dDMP-Na+ complexes have a higher stability than the single strands alone which could also be expanded upon for the RNA DMPs in future studies.

Using the results obtained, it becomes possible to expand the study to determine a quick and easy method to calculate the relative stability of nucleic acid molecules of hopefully any length by empirical means based on quantum mechanics. To do so, more advancements in computational methods must be developed to reduce the cost of quantum calculations on larger systems. Such advancements would allow our understanding of genetic material to increase quite significantly and thus can be applied to many issues of modern times, including genetic engineering, cancer research, epigenetics, etc.

Conclusion

Using the Gaussian16 DFT model (Frisch et al., 2014), the relative stabilities of 2 DNA DMPs and 3 RNA DMPs were calculated theoretically. The Hartree-Fock energies of the DNA AC and GT strands as well as those of the RNA AC, GT, and GU strands respectively were of -9.5672 x10-15 J, -1.0153 x10-14 J, -1.0223 x10-14 J, -1.0809 x10-14 J, and -1.0638 x10-14 J. No experimental data was available to compare these results as is common for computational studies of nucleic acid structures. It is very challenging to obtain specific structures of nucleic acids experimentally making computational methods the most reliable mean to determine these structures, but making the results limited in reliability since experimental results cannot be used to ensure the calculations were accurate.

Many studies using computational methods to determine the structure of nucleic acid molecules have looked at complexes with metals as done by Poltev et al. (2009). The same can be seen in the nucleic acid database (Nucleic Acid Database, 2023) and may bring interesting avenues for genetic engineering and nucleic acid drug development. As such, a quantum mechanics-oriented analysis of the orbital interactions of these metals with the nucleic acid molecules may help identify ways to stabilize naturally unstable nucleic acid systems. ■

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THE IL-10 SECRETED BY MEMORY CD4+ T CELLS FROM THE ACTIVATION OF THE β2-ADRENERGIC RECEPTOR WITH NEBIVOLOL

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ABSTRACT

This study explores how the β-blocker nebivolol inhibits pro-inflammatory IL-17, potentially through the Th17/Treg balance theory (Gonczi et al., 2017, 2021, 2023; Lee, 2018). This theory suggests that inflammatory and anti-inflammatory responses balance each other to maintain good health (Lee, 2018). Increased anti-inflammatory IL-10 secretion may play a role in this regulatory process (Gonczi et al., 2017; Lee, 2018). Peripheral blood mononuclear cells (PBMCs) were isolated from healthy participants, and memory CD4+ T cells were purified. Cells were cultured under various conditions, including activation with antibody multicomplex and nebivolol treatment, followed by enzyme-linked immunofluorescent assay (ELISA) to measure IL-10 secretion levels. The data indicate that nebivolol treatment did not result in a significant increase in IL-10 secretion compared to activated controls, suggesting alternative pathways for nebivolol's effect on IL-17A inhibition in T cells beyond IL-10 regulation. Limitations include variability in Treg proportions in memory CD4+ T cells and incubation time differences for peak IL-10 secretion. Future research should implement flow cytometry for Treg identification and refine IL-10 secretion protocols specific to Tregs to enhance understanding of immune regulation and potential therapeutic applications.

Keywords: *Immunology, interleukin, β-blocker, adrenaline receptor, autoimmune disease.*

Infections pose ongoing challenges for our immune system, relying on intricate cellular interactions to defend against harm. In cellular immunology, a network of specialized cells collaborates to maintain a delicate balance between defense and regulation, crucial for our survival and good health. This immunological balance involves various types of immune cells, including T lymphocytes and macrophages, which work together to fight off pathogens and prevent harmful inflammation that can lead to chronic diseases (Punt, 2018). For example, multiple sclerosis (MS) is a chronic disease that is caused by autoreactive T cells, which target and destroy healthy tissues (Anaya et al., 2013; Paroni et al., 2017). These T cells migrate through the blood-brain barrier and destroy the myelin sheath, which is responsible for the efficient and rapid electrical transmissions between neurons, through inflammatory responses (Nielsen et al., 2017). In summary, the lack of anti-inflammatory regulation responses causes the inflammation to become chronic; thus, tissue damage and neurological deficits in patients with MS occur (Nielsen et al., 2017; Paroni et al., 2017).

The third-generation β-blocker nebivolol is prescribed to treat high blood pressure (hypertension) and heart failure due to its ability to dilate blood vessels (Gonczi et al., 2021). However, its impact on the immune system remains relatively unexplored, despite evidence suggesting its potential for eliciting anti-inflammatory responses in CD4+ T lymphocytes, a topic investigated in this laboratory (Gonczi et al., 2021, 2023). Further research into the mechanisms underlying nebivolol's anti-inflammatory effects could provide insights into its potential use in treating inflammation triggered by infections.

In lymph nodes, certain types of white blood cells, known as naïve CD4+ T lymphocytes, transform into different functional T cell types like T helper cells (Th) 1, Th2 cells, and regulatory T cells (Tregs) when they encounter foreign particles called antigens (Gonczi et al., 2017; Lee, 2018). These antigens can be components of bacteria or other foreign invaders. The antigens are presented to the T cells by specialized immune cells called antigen-presenting cells (APCs). When CD4+ T cells interact with these APCs, they become activated and undergo changes, transforming into various cell types like Th cells or memory T cells (Gonczi et al., 2023). This transformation is guided by small proteins called cytokines, which act as messengers released by both APCs and T cells to trigger intracellular signaling pathways and coordinate immune responses.

Interleukin 10 (IL-10), a cytokine secreted in large amounts by Treg cells, plays a crucial role in maintaining a balanced immune system by suppressing the secretion of IL-17, a pro-inflammatory cytokine produced by Th17 cells (Gonczi et al., 2021; Lee, 2018). IL-10's ability to regulate IL-17 secretion helps prevent excessive inflammation and maintains immune balance, which is important for preventing autoimmune diseases and chronic inflammation (Gonczi et al., 2021;

Lee, 2018).

CD4+ T cells possess adrenergic receptors (ARs), with β2AR being predominantly expressed (Gonczi et al., 2017, 2023). These receptors are G protein-coupled receptors (GPCRs) that can initiate various intracellular signals depending on the compound that binds to them (Gonczi et al., 2017, 2023). Our research team found that IL-17A, an isotype of IL-17, is specifically influenced by β2AR (Gonczi et al., 2021, 2023). An agonist is a compound that activates a receptor to produce a cellular response. For instance, the β2AR agonist terbutaline stimulates IL-17A secretion by binding to β2AR, while nebivolol, functioning as a β2AR inverse agonist, inhibits this process by affecting an alternative intracellular pathway (Gonczi et al., 2021, 2023).

According to the Th17/Treg balance theory, nebivolol's ability to inhibit IL-17A secretion may involve increased IL-10 release (Lee, 2018). We expected that cells treated with nebivolol would have higher IL-10 levels. To test this hypothesis, IL-10 levels were measured in cells treated with nebivolol compared to untreated cells using an enzyme-linked immunofluorescent assay (ELISA). This method helped us check if nebivolol treatment increases IL-10 secretion.

Methods

PARTICIPANTS. Human peripheral blood mononuclear cells (PBMCs) were isolated from the peripheral blood of healthy participants. Information about their health was collected through a questionnaire and signed consent form was obtained. This study was approved by Concordia Human Research Ethics Committee #30009292. The healthy participants were individuals who had not consumed any recreational drugs within two weeks prior to the blood draw and did not have any autoimmune diseases, immune deficiencies, recent cancer diagnoses, or recent surgeries. Additionally, individuals taking medications that could influence the immune system, such as anti-inflammatory drugs, histamines, or psychiatric medications, were not eligible to participate. To keep the anonymity of the participants, their samples were labelled as hormonal regulation of T cell (HRT). A licensed nurse from the School of Health collected blood from the healthy participants. In this research, there were seven participants which will be referred to as: HRT 7/22/26/39/57/59/68.

PURIFICATION OF CD4+ T CELL. In a biosafety cabinet, the 1:1 mixture of blood samples and 1X sterile phosphate-buffered saline (PBS) were carefully poured to another on top of 13 mL of lymphocyte separation medium. Once the samples were in the centrifuge for 30 minutes at 1800 rpm, the cloudy layer containing the PBMCs between the ficoll and plasma layers was collected. Following another round of centrifuge for 15 minutes at 1500 rpm, the supernatant was discarded, and the PBMCs were reconstituted in recommended media. Under the microscope, the mixture of PBMCs and methylene blue dye was transferred in a hemocytometer for cell counting. The memory CD4+ T cells were isolated through negative selection, selectively removing all other cells. The solution with CD4+ T cell was collected and dissolved in cell media, then dyed with 0.4% trypan blue stain in a hemocytometer for counting the cells.

CELL CULTURE. In each well in a 96-cell conical wells, there were 3×105 CD4+ cells in 160 µL of media for all samples. In this study, there were four conditions in triplicates. They were the following: no activation (NA), activated cells (Act), activated cells with 10 µM nebivolol (Act+Neb), and the vehicle control contained activated cells in 10 µM glycerin (Act+Vc). For the NA, only 200 µL of media with the cells were present. For the Act samples, 20 µL of immunocult (antibody multicomplex of anti-CD3, anti-CD8, and anti-CD3) and an additional 20 µL of media were added. For the Act+Neb samples, there were 20 µL of immunocult and 20 µL of 10µM nebivolol solution. Lastly, the vehicle (Act+Vc) control had 20 µL of immunocult and 20 µL of glycerol. The cell cultures were incubated in 37β. After 5 days of incubation, the cells were centrifuged at 1600 rpm for six minutes to separate them, and the supernatant was collected and transferred to a new 96-well plate. The plate was then stored at -20°C for use in the ELISA experiments.

ELISA. The detection of IL-10 was performed with the ELISA technique. The 96 well ELISA flat-bottom plates, and the IL-10 kit were used. The steps were followed based on the manufacturer's instructions.

DATA ANALYSIS. The ELISA plates were read at both 450 nm and 570 nm, which was the background, by the H1 hybrid reader. The absorbance difference was used to calculate the IL-10 concentration with the given standard curve equation.

The outliers were determined based on the range of the average +/- standard error from triplicates per control. After removing outliers, IL-10-fold change was calculated by dividing sample concentrations by the average concentration of the activated control, which was set to 1. Since the fold change data was normalized to the activation control, the units are referred as arbitrary unit (AU).

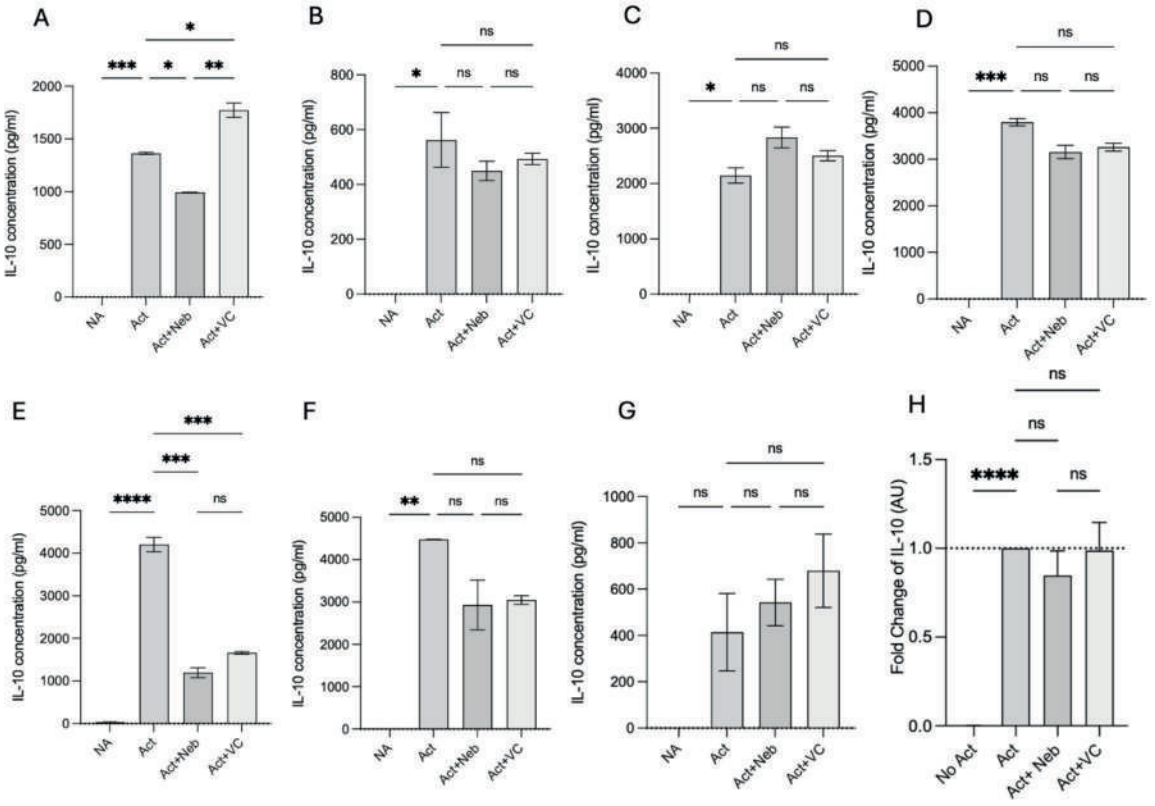
For the evaluation of the statistical significance between the control and treatment groups, a one-way ANOVA analysis followed by Tukey's multiple comparison test was performed. The statistical significance was determined using an alpha level of 0.05. This means that any p-value less than 0.05 (*$p < 0.05$) was considered statistically significant. This threshold ensures that we are at least 95% confident in our findings.

Results

In Figure 1, the IL-10 concentrations (pg/mL) of the seven independent participants are displayed as follows: (A) HRT 7 (B) HRT 22 (C) HRT 39 (D) HRT 59 (E) HRT 68 (F) HRT 57 (G) HRT 26. (H) displays the summary graph presenting the IL-10 production pool data of all seven participants, represented as a fold change compared to the activated control, which was set to 1.0. The data was set in Arbitrary Unit (AU). The memory CD4+ T cells were activated (Act) by immunocult for 5 days and were incubated with either the 10µM nebivolol (Neb) sample (Act+Neb) or the 10µM glycerol medium vehicle (Act+Vc). The error graphs represent the standard error of the mean (SEM) for each experimental condition. The significance levels were determined using a one-way analysis of variance (ANOVA) followed by Turkey's multiple comparisons tests. *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$, ****$P<0.0001$, ns = not significant.

Each participant's experiment included four controls representing different conditions of the CD4+ T cells. The NA control indicates that CD4+ T cells were not

Figure 1. *The figure depicts ELISA analysis of IL-10 secretion in memory CD4+ T cells treated with Nebivolol from seven participants.*



exposed to the antibody multicomplex, which prevented their transformation into T cell subsets and did not cause IL-10 cytokine secretion. This control establishes the baseline IL-10 secretion level without the external stimuli. The supernatant from the nebivolol treatment on activated CD4+ T cells was used to measure the drug's specific effects on IL-10 secretion. Nebivolol (10μM) was dissolved in glycerol medium, which could interfere with binding to CD4+ T cell receptors and the detection of secreted IL-10. These controls enhance the experimental design and strengthen result interpretation by accounting for potential differences in IL-10 secretion due to activation of CD4+ T cells or exposure to nebivolol alone or its glycerol medium.

During the data analysis of the ELISA experiments, two adjustments were made. Outliers, deviating from the average +/- standard deviation range, were identified in all participants' controls and excluded from averaged concentrations. Additionally, the duplicated absorbance of the highest standard concentration (500 pg/mL) was omitted for all participants except HRT 68 due to a closer R2 to 1. This data validation process confirmed that sample absorbances fell within the standard range, justifying its removal.

In the figure, the independent ELISA experiments displayed similar patterns to summary graph H, but with some differences. The summary graph H showed no significance between controls, except for the comparison between non-activated (NA) and activated (Act) conditions. All independent ELISA experiments for the HRT participants showed a significant increase in IL-10 secretion from the Act to the NA control, which was consistent with the summary fold change graph in graph H. The only exemption was HRT 26 since there were no significant increase of the Act compared to the NA. The HRT 22/39/57/59 experiments demonstrated no significant differences between controls other than the Act and NA, reflecting the summary graph.

The observed deviations in IL-10 secretion patterns from the independent experiments were influenced by significant IL-10 secretion in the activated (Act) control compared to other experimental conditions. Notably, HRT 7 and 68 showed a significant increase in IL-10 secretion in the Act control compared to the Act+Neb treated control, contrary to the summary graph. Additionally, they also showed contrasting effects on IL-10 secretion between the Act+Vc control and the Act control. HRT 7 in the Act+Vc condition exhibited a significant increase in IL-10 secretion compared to the Act alone. Conversely, HRT 68 showed a notable and significant decrease in IL-10 secretion in the Act+Vc control compared to the Act alone. HRT 7 was the only experiment that showed a significant decrease in IL-10 secretion in the Act+Neb group compared to the Act+Vc group. These differences suggest interference by the glycerol medium with IL-10 secretion and diverge from the summary graph. We anticipated no significant difference between the Act+Vc and Act+Neb groups, as well as between the Act and Act+Vc, to demonstrate that the glycerol medium does not interfere with the effect of nebivolol on IL-10 detection or secretion. Importantly, the summary graph showed no significant differences observed between these control groups.

In conclusion, most independent ELISA experiments demonstrated patterns consistent with the summary graph, with notable variations in the effects of nebivolol treatment and vehicle control on IL-10 secretion across different HRT participants.

Discussion

In our study, we explored the impact of nebivolol, a third generation **β**-blocker used to treat hypertension and heart failure (Gonczi et al., 2021). The researchers in our laboratory found that nebivolol can reduce inflammation by blocking the production of IL-17A in CD4+ T cells (Gonczi et al., 2021, 2023). For this research project, it was investigated whether nebivolol increased the secretion of the anti-inflammatory cytokine IL-10 which would explain the inhibition of IL-17A by the Th17/Treg balance theory (Gonczi et al.,

2021, 2023; Lee, 2018). However, our results did not show any difference in IL-10 secretion between activated memory CD4+ T cells control and nebivolol-treated (Act+Neb control) cells. Although there was a trend towards increased IL-10 in HRT 26, the increase was not substantial enough to support the hypothesis. This suggests that nebivolol's inhibition of IL-17A may not be linked to an increase in IL-10 secretion, indicating the involvement of other pathways in its effect on CD4+ T cells.

The limitations of our study include uncertainties regarding the proportion of T regulatory cells (Tregs) within the isolated memory CD4+ T cell population from patients. This proportion most likely varies between participants, potentially impacting our results. Additionally, as Tregs are not memory cells, it was possible that only a few Tregs were present, leading to diluted or insufficient IL-10 secretion, which could affect statistical significance. Consequently, we are unsure about the origin of the observed IL-10 increase from the non-activated (NA) to the activated (Act) conditions.

Another limitation could be differences in incubation times. CD4+ memory T cells has an enhanced and fast response to cytokine secretion when activated by the immunocult complex. However, Tregs are not memory cells, and they may require longer incubation periods to secrete IL-10 in response to the immunocult complex. Additionally, we observed different reactions among cells from different participants, which could introduce variability in the experimental outcomes.

For future research, we recommend implementing flow cytometry to accurately determine the proportion of T regulatory cells (Tregs) within the memory CD4+ T cell population. This technique could be used to identify Tregs based on specific cell surface markers or intracellular staining, providing valuable insights into the composition of these cells. Furthermore, future studies could also focus on refining the protocol for investigating IL-10 secretion specifically from Tregs. Optimizing the experimental protocol to target and analyze IL-10 secretion by Tregs could enhance our understanding of their role in immune regulation and provide more nuanced insights into the mechanisms of underlying immune balance and response. These efforts will deepen our understanding of immune regulation and offer insights for potential therapeutic approaches to infectious diseases. ■

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THE IMPORTANCE OF REGENERATING FORESTS FOR BIODIVERSITY CONSERVATION: INSIGHTS FROM BIRD COMMUNITIES

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ABSTRACT

Biodiversity is crucial for ecological research and ecosystem function, but human activities have led to widespread habitat loss and threats to biodiversity. Recent studies challenge the belief that only primary forests preserve biodiversity, as 20-year-old secondary forests can exhibit comparable levels. We emphasize the significance of studying regenerating and human-altered forests. Our research explores the impact of such forests on avian communities, focusing on different habitat and forest types. Using Non-metric Multidimensional Scaling and Analysis of Similarities, we analyze bird community composition across various habitats. The Parker index and Analysis of Variance evaluate bird sensitivity to habitat changes. Results indicate significant differences in bird communities and sensitivity based on forest and habitat types. The study provides insights into forest integrity, contributing to improved conservation practices in regenerating and human-altered forests. Limitations include assumptions due to limited fragmented plots, suggesting avenues for future research to enhance forest regeneration efforts.

Keywords: *Biodiversity, regeneration, conservation, avian, forests.*

Biodiversity plays a fundamental role in ecological research, underpinning ecosystem resilience and function (Naeem et al., 2016). However, the world is currently facing significant threats to biodiversity due to widespread habitat loss driven by human activities. While substantial efforts have been devoted to understanding the conservation importance of primary forests, the role of regenerating and human-altered forests in preserving biodiversity remains an unresolved and crucial question (Rozendaal et al., 2019).

For clarity, primary forests are defined as those that have remained largely unaffected by human activity, whereas secondary forests are those that have regenerated after significant human disturbance. Forest fragments refer to small areas of forest that have become isolated or separated from larger forested regions, often as a result of human activities such as deforestation or land conversion (Mann et al., 2023). In contrast, contiguous forests are characterized by continuous and unbroken expanses of undivided forest, remaining uninterrupted by other land uses (Seedre et al., 2018).

Recent studies reveal that 20-year-old secondary forests can exhibit biodiversity levels comparable to primary forests (Rozendaal et al., 2019). This discovery challenges the conventional belief that primary forests are the sole guardians of biodiversity, highlighting the potential of secondary forests to rapidly conserve Earth's rich biodiversity. Thus, our research emphasizes the importance of studying regenerating and human-altered forests.

Over the past 40-60 years, Costa Rica has undergone profound land surface transformations, characterized by extensive deforestation and the expansion of pasturelands (Ypsilantis, 1992). During this period, forest remnants served as critical refuges for many forest species. Fortunately, in recent decades, a noticeable trend of forest regeneration has emerged, elevating the importance of secondary forests in species conservation (Tafoya et al., 2020). Additionally, these regenerating forests now act as vital corridors, connecting fragmented primary forests and providing potential safe havens for numerous species.

This study seeks to explore the impact of regenerating and human-altered forests on the conservation of forest species, with a primary emphasis on investigating specific habitat types based on land use history, including old reserve, new reserve, and fragmented forest. Additionally, we will examine two types of forests, namely, contiguous forest and forest fragment, to comprehensively assess their roles in biodiversity preservation. To address this question, we will primarily examine avian communities, which serve as excellent indicators of forest health due to their diverse responses to habitat quality (Durães et al., 2013).

Our primary objective is to explore the differences in bird communities and their sensitivity in relation to the different land use history types and forest types. We hypothesize that (1) significant differences will be observed in bird communities and sensitivity based on land use history, indicating variations in forest integrity; and (2) there will be significant distinctions in bird communities and sensitivity between the two forest types, highlighting unique ecological dynamics in each.

The findings from this study will offer valuable insights

into how different habitat and forest types influence bird communities, their sensitivity to changes, and the overall integrity of the forest ecosystem. By identifying the most valuable forest types for supporting bird species adapted to primary habitats, we can contribute to improved conservation and management practices, ensuring the sustainable protection of biodiversity in regenerating and human-altered forests.

Methods

The study, which successfully documented an impressive total of 184 bird species, was conducted in the San Miguel de Matina region of the Caribbean lowlands in Costa Rica, encompassing an elevation range of 20-300 meters (Kappelle, 2016). Data collection occurred from 2019 to 2022, with weekly or biweekly bird counts conducted throughout the year. The surveys were conducted along 700-meter transects within each habitat, consistently between 8-10 in the morning, to ensure standardized sampling conditions. All birds observed or heard within the habitat during the counts were recorded while birds outside the transect area were excluded from the analysis. Unknown bird species were not registered.

A total of 197 surveys were conducted across three distinct habitats: the old reserve, the new reserve, and the fragmented forest. These habitat selections were based on their land use history and representation of different forest types. The area has experienced human interference for several centuries since the first Spanish settlement, resulting in closely packed habitats (Brühl et al., 2023). The lowlands are characterized by banana plantations and urbanization, while the higher elevations boast stretches of untouched nature, starting with the Barbilla National Park and continuing into the undisturbed Talamanca Mountain Range. The study area is situated between the green deserts of banana plantations and the lush vegetation of the mountains, experiencing a tropical climate with an average annual temperature of 24.6 °C (76.3 °F) and an annual rainfall of 3226 mm (127.0 inches) (*Limón Climate: Average Temperature, Weather by Month, Limón Water Temperature - Climate-Data.org*, n.d.).

The three habitat types were defined based on their distinct land use histories. The old reserve represents an ancient forest that underwent selective logging until eight years ago, resulting in the removal of valuable tree species while preserving a significant number of large trees. In contrast, the new reserve is a 40-year-old reforestation project focused on a single species, Vochysia guatemalensis. It was established four decades ago but has since been abandoned for about 20 years. Notably, the new reserve is surrounded by various types of forest habitats and is characterized by a relatively low tree composition compared to other areas.

On the other hand, the fragmented forest is a 40-year-old naturally regenerated secondary forest occupying a small patch of approximately 7 hectares, with farmland surrounding it. This forest fragment exhibits a medium tree species composition, distinguishing it from the other habitat types. Within the study, a distinction was made between two types of forest: forest fragments and contiguous forests. The old reserve and the new reserve were categorized as contiguous forests since they are part of larger forested areas without significant breaks or interruptions. Conversely, the fragmented forest was classified as a forest fragment due to its isolated nature and separation from surrounding forested areas.

During the surveys, comprehensive data was collected to assess bird abundance and species richness. The total number of individuals and species observed in each count was meticulously recorded to quantify the population and diversity of birds within each habitat. Additionally, the Shannon Wiener index was calculated to evaluate the ecological diversity of bird communities, providing insights into species richness and evenness within each habitat (Ortiz-Burgos, 2015).

To ensure the adoption of appropriate methodologies for data analysis, a thorough literature search was conducted to gather relevant information on established practices. The research aimed to gain a broad understanding of bird communities in the three different habitats by employing analysis of variance (ANOVA) tests in JASP, a statistical software package. These tests were performed to determine significant differences in the total number of individuals, species, and diversity among the habitats. An alpha level of $p < 0.05$ was used to determine statistical significance.

Furthermore, the study aimed to assess the relationship between the different bird species found and the forest integrity and conservation value. To visualize the differences between bird communities in different habitats, non-metric Multidimensional Scaling (NMDS) analysis using the Bray-Curtis dissimilarity measure was conducted in R, a statistical programming language (Bakker, 2023; Durães et al., 2013) . A stress value of less than 0.2 indicated a good representation of the data in the NMDS plot. Additionally, Analysis Of Similarity (ANOSIM) was carried out to determine if significant differences existed between the bird communities in different habitats and forest types.

Additionally, the Parker index, which categorizes sensitivity into low (L), medium (M), and high (H) levels, was utilized to evaluate the sensitivity of bird species to habitats impacted by human disturbance (Alexandrino et al., 2016; Stotz, 1996). This index facilitated the examination of variations in sensitivity (SNST) among different bird species within various communities, offering insights into their potential as indicators of forest integrity.

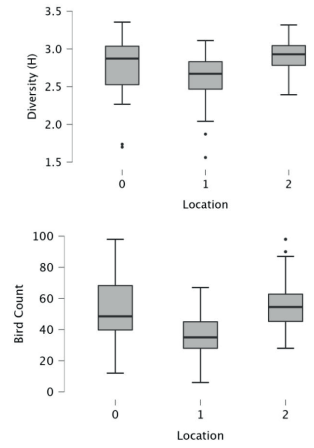
To assess significant differences in sensitivity among the bird species found, ANOVA tests were conducted. These tests aimed to establish variations in sensitivity levels within different bird communities and habitats. The ANOVA analyses were again performed using JASP. During the statistical analyses, a coding system was employed to label the habitat types and sensitivity levels. The contiguous forest was labeled as 0, and the forest fragment was labeled as 1. Similarly, the old reserve was assigned the label 0, the new reserve was labeled 1, and the forest fragment was labeled 2 to represent the different habitats.

To evaluate sensitivity levels, numerical values were assigned to the Parker index categories. L (low) was assigned a value of 0, M (medium) was assigned a value of 1, and H (high) was assigned a value of 2. This numerical representation facilitated the analysis of sensitivity variations among different bird species within different communities.

Results

ANOVAs were conducted to assess differences in the number of individuals, number of species, and biodiversity among the different habitats based on their land use history. The analysis revealed statistically significant differences in biodiversity, number of individuals, and number of species among the different land use history categories (Table 1). Significance levels are indicated by p-values (< 0.001), demonstrating the statistical significance of the differences observed (since p <0.05). Descriptive plots showed that the new reserve consistently exhibited the lowest mean values for these parameters compared to the old reserve and fragmented forest (Figure 1).

Figure 1. *Descriptive ANOVA plots of Biodiversity, Bird Count, and Species Richness among Old Reserve (0), New Reserve (1), and Fragmented Forest (2) Habitats in San Miguel de Matina, Costa Rica.*



In order to further understand the differences in bird communities among different forest types and land use history categories, NMDS and ANOSIM analyses were conducted. The NMDS plots demonstrated clear clustering of bird communities based on their respective habitat types and land use history (Figure 2; Figure 3). ANOSIM analysis yielded significant differences in community composition between all habitat types and between both forest types (Table 1).

Figure 2. *Non-metric Multidimensional Scaling (NMDS) Plot Comparing Bird Community Composition among Three Habitat Types Based on Land Use History (Old Reserve, New Reserve, Fragmented Forest) in San Miguel de Matina, Costa Rica.*

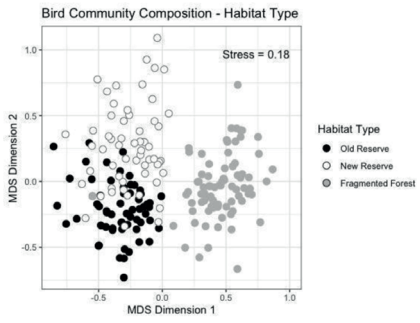
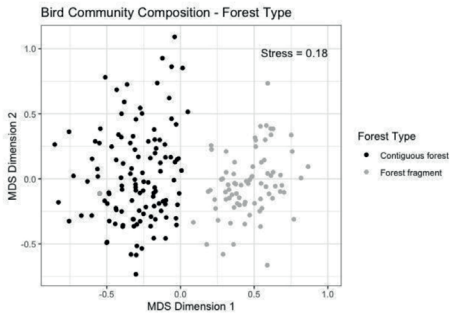


Figure 3. *Non-metric Multidimensional Scaling (NMDS) Plot Comparing Bird Community Composition among Two Forest Types (Contiguous forest, Forest fragment) in San Miguel de Matina, Costa Rica.*



Additionally, ANOVAs were performed to investigate significant differences in sensitivity among the bird communities in different forest types and land use history. The analysis revealed noteworthy variations in sensitivity between both forest types and among all habitat types (Table 1). Descriptive plots further indicated that the old reserve, new reserve, and the contiguous forest exhibited a higher abundance of sensitive bird species compared to the fragmented forest (Figure 4).

Figure 4. *Descriptive ANOVA Plots of Sensitivity among Old Reserve (0), New Reserve (1), and Fragmented Forest (2) Habitats, and Contiguous Forest (0) and Forest Fragment (1) in San Miguel de Matina, Costa Rica.*

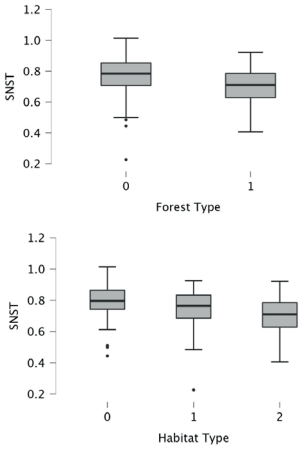


Table 1. *Summary of Results from Statistical Analyses Assessing Bird Community Differences Among Forest Types and Land Use History.*

Analysis	Parameter	F-Value	p-Value	R-Value	p-Value
ANOVA	Biodiversity	15.619	< 0.001		
	Number of Individuals	23.175	< 0.001		
	Number of Species	19.106	< 0.001		
ANOSIM	Community Composition (Habitat Types)			0.588	< 0.001
	Community Composition (Forest Types)			0.552	< 0.001
ANOVA (Bird Sensitivity)	Forest Types	14.308	< 0.001		
	Habitat Types	9.721	< 0.001		

Note. The table includes results from ANOVAs and ANOSIM analysis, with F-values representing the magnitude of variation and R-values indicating the strength of dissimilarity in community composition. Significance levels, indicated by p-values less than 0.001, demonstrate the statistical significance (since p <0.05) of the observed differences.

Discussion

Our study reveals significant differences in bird communities and bird sensitivity based on forest types and land use history. The fragmented forest, characterized

by extensive forest edges, proximity to open country habitats, and limited forest interior, shows a distinct separation in the NMDS analysis compared to the contiguous forest. This separation is due to the availability of a wide range of niches in the fragmented forest that are absent in the contiguous forest. In contrast, the contiguous forest provides niches for species adapted to a more covered habitat. Within the contiguous forest, the new reserve exhibits a relatively simple tree community with monocultural practices and a younger understory, while the old reserve, with several decades of development, showcases a more complex tree community. Despite lacking high-value timber species, its complexity offers more niches, leading to higher species richness. These findings provide valuable insights into forest integrity, as forests with higher complexity and species diversity indicate a more intact and healthier ecosystem.

In addition to assessing bird communities, we analyzed Parker's sensitivity index and coupled it with the assigned numerical values to evaluate forest integrity. High sensitivity forest birds were expected to be more common in less altered habitats, closer to primary forests. The average SNST of bird communities indicated that contiguous forest patches generally exhibited higher forest integrity. The fragmented forest had the lowest average sensitivity, suggesting a higher presence of species adapted to human-altered environments. Interestingly, even within the contiguous forest, there was a significant difference in bird sensitivity between different habitats. The old growth selective logging habitat had a higher average of highly sensitive birds compared to the reforestation project, indicating higher integrity in the former (Figure 4).

The relative importance of forest type and habitat type warrants a closer examination. Upon analyzing the initial ANOVA results, it becomes apparent that the new reserve exhibits the lowest numbers of individuals, species, and overall biodiversity, indicating a limited tree diversity within its boundaries (Figure 1). However, an intriguing discrepancy arises as the new reserve surprisingly accommodates a greater abundance of sensitive bird species compared to the fragmented forest (Figure 4). This unexpected finding can potentially be attributed to the new reserve's contiguity with other forested areas, facilitating the presence of these bird species. Despite the lower tree species diversity, the new reserve capitalizes on its connectivity to adjacent forest patches, thereby enhancing its ecological value.

Delving into the forest structures, the new reserve stands out with its relatively simplified structure, while the fragmented forest, representing a naturally regenerated forest, displays a moderate level of complexity. In contrast, the old reserve surpasses both in complexity, emerging as the habitat with the highest level of structural intricacy among the three that were examined.

A notable observation within the new reserve is the dominance of Vochysia guatemalensis species, which accounts for over 90% of tree species with a trunk diameter at breast height (dbh) exceeding 10 cm. This finding suggests a low diversity of forest tree species within the new reserve. Conversely, the naturally regenerated forest lacks dominant species, resulting in a higher composition and diversity of tree species, contributing to the unique characteristics of this habitat.

Upon reflection, these compelling discoveries strongly support the notion that fragmented forest exerts a more significant influence than natural regeneration in shaping the sensitivity of bird communities. Forest type, therefore, seems to be more influential on both bird communities and the integrity of the forest ecosystem than habitat type.

Although the findings of this study offer insightful information, there are several limitations that should be addressed in future studies. One limitation is the reliance on assumptions due to the lack of other fragmented plots. It would be interesting for future studies to include additional fragmented forests to further test the observations we made. Additionally, future research should focus on identifying the specific habitat requirements of primary forest species or indicator species. This information would be valuable for informing future land purchases and property evaluations. Moreover, it may be beneficial to focus on key indicator species rather than entire bird communities to advance the regeneration of forests. For instance, the highly sensitive nunbird species, which we frequently observed in our counts, could serve as a useful indicator for assessing forest recovery.

Overall, bird communities are reliable indicators of forest integrity and exhibit significant differences between forest types and land use histories. Fragmented forests provided unique niches and hosted a diverse array of bird species but were less suitable for highly sensitive birds compared to contiguous forests. Forest type appeared to be more important than habitat type in determining bird community sensitivity. These findings contribute to our understanding of the relationship between forest characteristics, bird communities, and conservation strategies. ■

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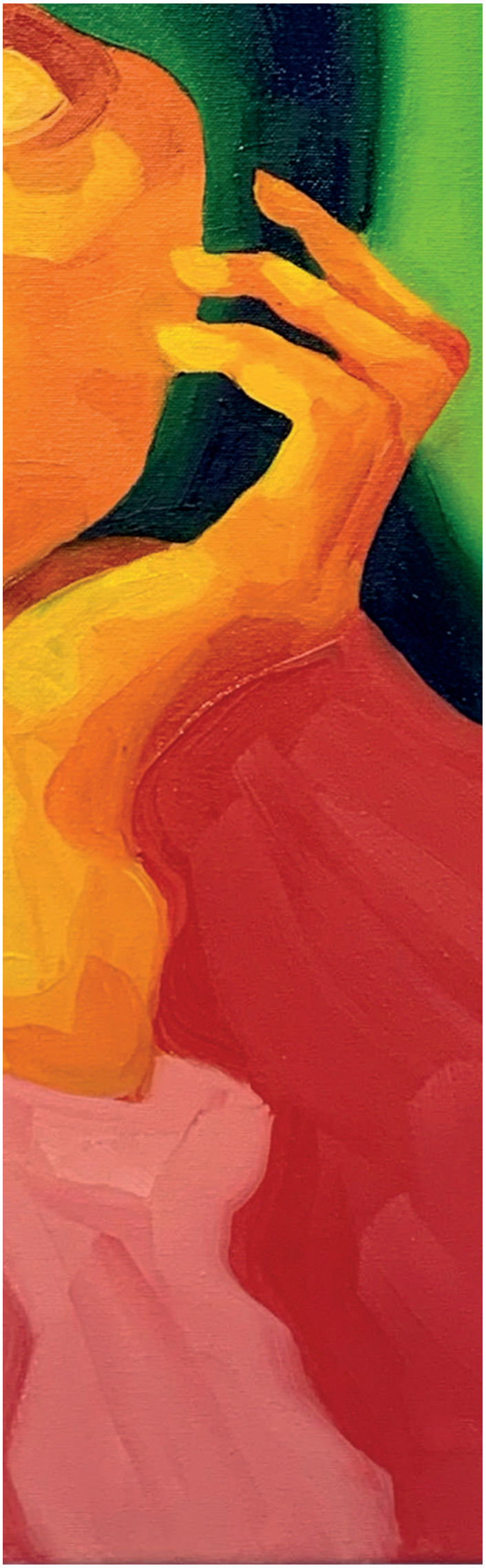

BIOGRAPHIES

BERLANT ALSABBAGH
editor-in-chief

Berlant is a third-year student majoring in biology with a minor in multi-disciplinary studies in science (Science College). She joined the journal team because of her passion for research, publications, and providing undergraduate students in both arts and sciences a platform to publish their work. After completing her degree, Berlant plans to pursue graduate school with a focus on research. Outside of academics, she is actively involved in various research projects mostly related to pain. In her free time, she enjoys exploring cafes, strolling through the city, and hiking in national parks.

LAURENCE CORRIVEAU
design coordinator and editor

Laurence is a last-year student doing Honours in Psychology. Although she initially joined the journal's editorial board based on her desire to contribute to the promotion of undergraduate scientific work, she quickly realized it would also become the perfect opportunity to use some of the artistic skills acquired through her previous degree in illustration by taking on the role of Design Coordinator. Laurence hopes to enter grad school in clinical psychology next fall. In her free time, she enjoys walking in nature (preferably in a forest inhabited by many different bird species), baking muffins and crocheting cardigans.

ANDREW WILCOX
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Andrew is a Concordia graduate (BA '24) of the Honours Philosophy and Professional Writing programs. As a new Concordia graduate, he joined the editor team to gain some practical experience as an editor. Andrew is now pursuing an MA degree in philosophy at Toronto Metropolitan University and is also a freelance editor and writer at his start-up, Wilcox Writing. Outside of academia, he sometimes produces various content, enjoys bicycling, and watches his favorite streamer, Vinesauce!

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editor

Rebecca is a second-year student in honors biochemistry. She joined the journal team because she is interested in reading about studies held in diverse fields of science. She hopes to go the medical school (or end up a biochemist). She loves doing art, reading literature and self-help books, and watching any good TV show.

KHYLEIGH BROWN
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Khyleigh is a second-year student doing a double major in Honours History and Liberal Arts. Her interest in Between Arts and Science stems from its unique opportunity to engage with academic works from outside of her fields of study. Khyleigh aims to work in academia and/or archival work in the future. In her spare time she enjoys podcasts, running, and listening to The Cure.

CYNTHIA COMEAU
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Cynthia is a second-year student specializing in psychology with a minor in multidisciplinary studies in science (the Science College). She joined the team to serve as the bridge between the editorial board and the authors/artists, motivated by her enthusiasm for coordinating and organizing projects. After completing her degree, Cynthia aims to pursue a career related to psychology or laboratory work. In her free time, she enjoys working on artistic projects, watching TV shows, spending time with her friends, and going on hikes.

CLAIRE DYMENT
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Claire graduated in May 2024 with an Honours BA in Psychology. She joined the ASFA journal team as an editor to learn more about different subjects than her area of study and to refine her writing by editing others! This fall she begins her post graduate journey across the pond at King's College London, studying mental health. Outside of academics she loves to ski and travel!

LEO LITKE
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Leo is a third-year Communication and Cultural Studies Major with a minor in Film Studies. This is his second time editing a student journal at Concordia, and he's excited to expand beyond the Communication Studies department. Outside of ASFA, he has worked for the Concordia Film Festival as both a panelist and assistant programmer, and he enjoys documentary filmmaking.

CLARA GEPNER
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Clara Gepner is a final year student in BSc Psychology. Her dedication to diverse and interdisciplinary research as well as interest in writing and editing led her to join the Journal. After her degree, she aims to work in the health sciences. When she's not studying, she loves to read fiction, go on long bike rides, and play board games with her friends.

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