An Analysis of French and English Indo-Caribbean Literary Depictions of Indentured Servitude and Its Associated Neurological Implications

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**Dedication:**

To the millions of Indo-Caribbean women, including my mom, grandmothers, and Papo, who have dedicated their lives to surviving, raising their families, and passing down their stories from generation to generation so that their children and their children’s children never forget their origins.

A special thank you to both of my extremely dedicated thesis advisors, Dr. Jenson and Dr. White, who both helped me accomplish a project that I, at times, doubted was viable and gave me the tools to increase Indo-Caribbean representation in academic literature.

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Abstract:

The Indo-Caribbean diaspora is largely unstudied in current scientific literature. However, 300,000 Americans and 2,500,000 people worldwide currently make up this demographic. Indo-Caribbeans are descendants of indentured laborers migrating from India to various English and French colonies, including Guyana, Trinidad and Tobago, French Guiana, and Guadeloupe, throughout the 19th and 20th centuries, serving as substitutes for slaves when slavery was illegalized in these colonies. The potential connection between the harsh and debilitating lifestyle of these indentured laborers and the disease prevalence in the descendants of this population is largely unexamined. To fully understand the experience of the Indo-Caribbean population, this thesis used numerous Indo-Caribbean novels, including *A House for Mr. Biswas*, *Valmiki’s Daughter*, *Aurore*, and the written history *Coolie Woman*, to understand the migration process from India to the Caribbean, the daily life as an indentured laborer, and the transition from a laborer to a freed person in the era of decolonization. The characterizations of the protagonists from each of these novels were examined through a social cognitive lens to understand how concepts like dehumanization, intergroup bias, and social defeat manifest in the lived environment. Then, these social cognition concepts were studied through past neuroscientific research to analyze their possible pathological ties to the neurological and/or psychiatric diseases, like substance abuse and depression, to demonstrate the connection between indentured labor and the current prevalence of disease.

In addition, this project examines how certain social structures, like race, gender roles, sexuality, and caste, influence the experiences of specific segments of the Indo-Caribbean population, especially in regard to the “marriage plot,” a literary theme or plot structure present in western European early modern and modern literature where marriage is centered around socioeconomic utility. This interdisciplinary study between Indo-Caribbean literature and neuroscience is the first step to attempt to understand how indentured labor may have affected the health of the current generation of Indo-Caribbean people.
Abstrait :

La diaspora indo-caribéenne ne figure guère dans la littérature scientifique. Cependant, 300 000 Américains et 2 500 000 personnes dans le monde constituent actuellement ce groupe démographique. Les Indo-Caribéens sont les descendants de travailleurs sous contrat émigrant de l'Inde vers diverses colonies anglaises et françaises, dont la Guyane, la Trinité-et-Tobago et la Guadeloupe, tout au long des XIXe et XXe siècles, servant de substituts aux esclaves lorsque l'esclavage est devenu illégal dans ces colonies. Le lien potentiel entre le mode de vie rude et débilitant de ces travailleurs sous contrat et la prévalence de la maladie chez les descendants de cette population est en grande partie non examiné. Pour comprendre pleinement l'expérience de la population indo-caribéenne, ce projet a utilisé de nombreux romans indo-caribéens, y compris A House for Mr. Biswas, Butterfly in the Wind, Valmiki's Daughter, Aurore, et Coolie Woman, pour comprendre le processus de migration de l'Inde aux Caraïbes, la vie quotidienne dans le travail sous contrat, et la transition de la main d'œuvre subordonnée au statut affranchi dans l'ère de la décolonisation. La caractérisation des protagonistes de chacun de ces romans a été examinée à travers la question de la cognition sociale pour comprendre comment des concepts comme la déshumanisation, le biais intergroupe et la défaite sociale se manifestent dans l'environnement social. Ensuite, ces concepts de cognition sociale ont été étudiés à travers des recherches antérieures pour analyser leurs éventuels liens pathologiques avec les maladies neurologiques, comme la toxicomanie et la dépression. Ces recherches démontreront le lien entre le travail sous contrat et la prévalence actuelle des maladies neurologiques. En outre, ce projet examine comment certaines démographiques sociales, constituées par la race, les rôles de genre, la sexualité, et la caste, influencent les expériences de certains segments de la population indo-caribéenne. Je m'engage en particulier avec le dynamique identifié par la critique littéraire
comme « l’intrigue du mariage, » c’est-à-dire l’organisation de la mobilité sociale de l’individu et de sa cohorte familiale autour des alliances sûres et prospères. Cette étude interdisciplinaire entre la littérature indo-caribéenne et les neurosciences est la première étape pour comprendre comment le travail sous contrat et la migration forcée affectent psychologiquement et physiologiquement la génération actuelle de personnes indo-caribéennes.
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Preface: A Century of Migration

Throughout the height of the COVID-19 pandemic, the most heavily impacted communities were immigrant and under-resourced populations in urban regions of the country. As a first generation Guyanese-American, the majority of my extended family lived in the hardest hit areas of New York, including the Bronx, Queens, and Brooklyn. In fact, the Guyanese immigrant population makes up the 2nd largest foreign-born population in Queens, New York. In April 2020, I lost my paternal grandmother, who was residing in Brooklyn during the height of the spread of coronavirus in the New York metropolitan area, to COVID-19. My grandmother passed away at 92 years old. I was more devastated over the cause of her death than her death itself. I knew her intimately and she had always told me that she had lived a complete life.

My paternal grandmother, or as I called her, “New York Grandma,” was born in 1928 in Guyana, a small country on the northern coast of South America in between Venezuela and Suriname. She lived in the then-British colony until immigrating to the United States with her 10 children and husband in 1976. Although she spent almost half of her life in the US, I always knew that Guyana was her true home. I grew up listening to stories about her garden, trips to the market to sell her produce, and early mornings cooking in Guyana. After she passed away, I realized that one of the most authentic links that tied me to my parents’ native country had been broken. New York Grandma and her contemporaries had lived rich lives not often represented in research. This inspired me to pursue this thesis project on the Indo-Caribbean experience and its neurological implications, as represented in literature and in personal narrative. Through this research, I hope to increase representation of a little-known community. I also hope to document the experiences of the descendants of the Indian Indenture system that have predominantly only been passed down anecdotally by generations who are slowly disappearing.
As a foreword to my study of narratives and published histories, I interviewed my maternal grandmother, one of my oldest relatives, in order to hear directly about my family’s personal journey from India to Guyana and then eventually to the United States. My maternal grandma, Satabhama Sooknanan (née Kellawan), also known by her “call name”, or nickname, “Rita”, was born in 1945 in Enmore Estates in Guyana. She is a second-generation Indo-Guyanese woman on her father’s side and third generation Indo-Guyanese on her mother’s side. Her father was the eldest of his parents’ children and my grandma was the third child, and first daughter, of seven children. In Guyana, being the eldest daughter often means that your ‘house name’, the name your close relatives called you, is Data (da/tah), resembling the English word “daughter.” As the eldest granddaughter, she grew up spending a lot of time with her Ajee (paternal grandmother) and Aja (paternal grandfather), both of whom came to Guyana as indentured workers around 1912, based on what my grandmother can recall. There were very few official documents that indentured workers owned in terms of their arrival date, so like many facets of my ancestors’ experiences, this is predominantly based on speculation and hearsay. However, my grandmother still vividly remembers the stories her Ajee, Chandrowlie, would tell her about her journey across the kala pani, reminiscent of the Hindi words for black water, in a blend of Hindi and fragmented English.

My great-great grandmother, my maternal grandmother’s paternal grandmother, was born in Kashmir, India around 1890, as my grandma recalls, and was a child bride, marrying someone she did know very well between the ages of 12 and 14. In accordance with Indian tradition, she moved to live with her husband’s family, which was around 100 miles away from her childhood home. It was common that the wife of a son would be similar to the servant of the house. My grandma explains that she would be the first to wake up, the last to eat, the first to clean, and the
last to sleep, and that was extremely normal in India at the turn of the 20th century. It was also tradition that the mother-in-law would control the money of the house. Sons would work, and the money was allocated based on the wishes of his mother. My grandma told me that one day her Ajee, “a naturally feisty woman”, asked her husband to give her money to buy something at the market. He responded that she would have to ask his mother, who would most definitely reject her request. Her mother-in-law overheard and was so offended by the conversation that she beat my grandmother’s Ajee. This pushed her to attempt to walk by foot to her parents’ house in an attempt to seek refuge.

On her long journey back to her parents’ house, she realized that her parents would never break tradition and take her side. During her journey, she ran into an Indian man who was hired by the British to recruit people to become indentured servants in the other British colonies abroad. Based on my grandma’s recollection, her Ajee was told that she would be living a peaceful life making a lot of money sifting sugar under a coconut tree. Then, after five years of working, she would be free to return to India with all the money she had earned. The Hindi word cheenee, sugar, specifically sticks out in my grandma’s memory. Weighing her options, my great-great grandmother decided to go on the ship in hopes of finding some sense of safety and independence. As the ship left the dock, this would be the last time she would ever see India and have any chance of seeing her husband or her parents ever again.

The voyage that followed took three months as the ship traveled from India across the Indian and Atlantic Oceans to Guyana. My grandma remembers her grandmother mentioning how cramped the ship was, with no sleeping quarters or privacy. Everyone on the ship cooked and slept collectively, creating a sense of community through their united struggle. During her voyage, she met a man, another indentured worker, and they supported each other throughout the
journey. He had left India because there was no work there for him and felt that he could make a better living by leaving the country. Eventually they became married in Guyana and he was my grandma’s Aja (paternal grandfather).

After three months, the ship docked at “The Depot”, as my grandma described it. Everyone on the ship was given a pair of work clothes and then lined up for sugar cane plantations owners to pick out their workers. My great-great grandmother and her new-found companion were both sent to Enmore Estates to work in the sugar plantations. They moved into a 12 yard by 20-yard house made of grass and mud with dirt floors and no windows. As my grandma said, “there was only one way in and one way out”. The “range”, as it was called was divided into three spaces: the bedroom, living room, and dining room. All the cooking was done outside over fire-powered stove-tops and there was no indoor plumbing.

In this house was where my grandma’s dad was born in 1914, the first born in his family. He began working in the Enmore Estate horse stables by the time he was 12 and was able to save enough money. This job led him to have future opportunities for social mobility which eventually gave him the resources to buy the materials to build his own house, a physical symbol of one’s fiscal and social independence. This was eventually where my grandma was born in 1945.

Since Guyana did not become independent until 1966, my grandma grew up heavily influenced by the British monarchy. One of her earlier memories is the coronation of Queen Elizabeth II in 1953. Across the estates, everyone was given flags and banners to show their pride and in school she was given extra biscuits and ribbons to put in her hair. She still has “God Save Our Gracious Queen”, a traditional patriotic British song, memorized. Everyone anxiously listened to the coronation ceremony over the radio. Although she only attended school until she
was 12, her entire education was formed by British, rather than West Indian, ideas, especially in terms of the literature and history studied. In contrast to many historical and biographical accounts, my grandma had completely positive sentiments towards the British during her childhood. They were visible as local police and political officials, but she never experienced any undeserved scrutiny and discrimination. However, she remembers that each village separated the white people, often called the overseers, from the Indian and African migrant workers. While the workers lived very similarly to my great-great-grandparents, the British had proper houses, with indoor plumbing, pools, and servants, who were often one of the indentured workers. Only white people and lead officials were allowed in that part of the village, so social hierarchy based on race was engrained throughout the community.

My grandma left school and began working in a tee-shirt factory at 12 years old to start contributing to the household. She worked until she was 17, when she became arranged to marry my grandfather. She had never met him and did not know what he looked like, but his family was known to be able to provide for my grandma and whatever children they were expected to have in the future. My grandparents married in April of 1963. For their honeymoon, they both went on their first airplane to Trinidad. During their honeymoon, the 80 Day Strike, in Guyana, over labor and trade policies, began. This halted transportation in and out of the country, so instead of being away for two weeks, they were in Trinidad for 90 days. This strike was an instigator for the independence of Guyana from Great Britain (Khan). After their honeymoon, in accordance with the Indian tradition, my grandma left her childhood home in Enmore Estates and moved to 64 Village in a house on the same street as my great-grandpa and my grandpa’s brother. Still a teenager, she attributes this transition to being a wife as what caused her to become an adult. There she would have four children, the eldest being my mother. While my
grandfather oversaw the local rice fields as a part of his father’s business, my grandma tended to the house and raised her children. My mom recalls that growing up my grandma’s favorite pastimes were reading romance novels and listening to Elvis Presley, which were much more westernized interests than her peers.

In 1966, Guyana declared independence from Great Britain. My grandma recalls that it was June 26th, 1966, because she was eight months pregnant with her second child. Shortly, after independence, there was contentious conflict between Afro-Guyanese and Indo-Guyanese populations, triggering the Guyanese race riots of the late 60’s (Bahadur, 2015). The battle for power in this young country led to increased political and economic corruption, triggering increased rates of immigration of Indo-Guyanese people to Canada and the United States in the 1970’s and 1980’s. Knowing that immigration became much more difficult when her children were older than 18, my grandma’s sister sponsored her to immigrate to New York in the late 70’s.

In 1980, my grandma and her children’s immigration applications were approved. At 34, my grandma migrated with her husband and four children under the age of 16 to Queens, New York. There she recalls finding a job for her and her husband in a lipstick factory working for $3.50 per hour. My grandparents and her children lived with my grandma’s sister and her children and others, in a house of 16 people, before being able to afford their own apartment. My grandparents worked to allow my mom to be the first in her extended family to attend university. Since migrating, my grandma has also lived in California and now lives in Indiana near her youngest daughter. She celebrated her 75th birthday this past Thanksgiving via Zoom with her four children, four children-in-law, and ten grandchildren.
Although I only presented my great-great grandmother’s story, the story of my paternal ancestors follows a similar pattern. Over the last 125 years, my ancestors migrated by ship to Guyana to become indentured laborers. After Guyana became independent, political and racial strains motivated them to immigrate to the United States or Canada for a safer and more prosperous life. In my lineage, there was at most one generation that both was born and had died in Guyana. While Guyana has dynamically influenced my culture and my sense of family, it was also place of transition that my family never completely settled into before leaving. The Indo-Caribbean experience is surviving a century of constant migration, adaptation, and perseverance.
Introduction

The Indo-Caribbean population is comprised of people of Indian origin who migrated to the Caribbean in the 19th and 20th centuries as indentured servants. After the abolition of slavery in the British and French Empires in 1833 and 1848 respectively, the British and French were in need of cheap labor for their plantations. As a solution, the British and French began recruiting Indian people as indentured servants to work in the Caribbean and Eastern Africa. Millions of indentured laborers were brought to British and French colonies in the Caribbean and East Africa from 1838 to 1917 (Roopnarine, 2003) (Figure 1). As indentured laborers, these migrants were entitled to more rights than slaves, like fixed wages and medical care, however, the Indo-Caribbean population still faced high degrees of subjugation under colonial rule (Bahadur, 2014). Even after the end of indenturement, Indo-Caribbeans lived under colonial rule and faced barriers to social mobility. Following the independence of many Caribbean nations in the 1960s, there was a massive wave of migration from the Caribbean to the United States and Canada from the 1970s to the 1990s. Within 150 years there have been two massive waves in migration in this population causing cultural rifts between Indian, Caribbean, and western cultures (Ramsawak, 2020). While this population is largely unstudied in scientific literature, the Indo-Caribbean population makes up about 300,000 Americans and 2,500,000 people worldwide, with heightened population densities in Queens, New York, Toronto, Canada, Georgetown, Guyana, and Port of Spain, Trinidad and Tobago.

The largest contribution to knowledge about the Indo-Caribbean experience has been literary accounts as well as academic articles on the living conditions of Indo-Caribbean indentured labors and their descendants. Throughout this study, I examined literary accounts through critically acclaimed novels by Indo-Caribbean authors. The most notable Indo-
Caribbean novel *A House for Mr. Biswas* earned Trinidadian author V.S Naipaul a Nobel Prize in Literature. *A House for Mr. Biswas* discusses the trials and tribulations of a descendant of Indo-Trinidadian indentured laborers trying to become fiscally independent and an owner of property. Although it is a fictive work based on his father’s life, Naipaul famously said, “An autobiography can distort, facts can be realigned. But fiction never lies. It reveals the writer totally,” when asked why he never wrote an autobiography. For the French experience of the Indo-Caribbean trajectory, I study *Aurore* by Ernest Moutoussamy, which discussed the migration of a romantic couple from opposing castes from India to Guadeloupe. (Other works from the French-language tradition on Indo-Caribbean experience, by non-Indo-Caribbean authors, include Maryse Condé’s *Traversée de la mangrove* (1989) and Raphael Confiant’s 2004 *La Panse du Chacal.*) Additionally, intersectionality and the female and queer experiences were essential to examining the complete Indo-Caribbean experience. *Valmiki’s Daughter* by Shani Mootoo focuses on the specific struggles of characters from a variety genders and sexualities in Indo-Caribbean society in the latter part of the 20th century. *Coolie Woman* by Gaiutra Bahadur also focuses on the experiences of Indo-Caribbean women in a colonial and patriarchal society through a written history. In all of these books, marriage plays a major factor in the Indo-Caribbean social structure, which aligns with Dr. Joan Dejean’s “marriage plot” (Dejean 128). The marriage plot discusses the plot of novels, predominantly those written in 19th century in western European, that are entirely focused on the arrangement of marriages for purposes of social and economic mobility. These marriages are society’s method for reproducing the current social order in the next generation in western Europe. Marriages were a key factor in the plots of each of these novels by enforcing Indo-Caribbean people to only have socially acceptable marriages if they marry someone of the opposite gender, same caste, and same race, which often
served as a point of contention for the protagonist. Marriage was a key part of Indo-Caribbean society for the same reason they were for western European society, it kept the sanctity of the social structure for the next generation no matter what the labor or political conditions may take place in the future. Through the analysis of all of these novels, a holistic perspective on Indo-Caribbean experience will be presented to give a wide variety of perspectives a voice.

Through a literary analysis of these texts, it is revealed that the characters, especially those living as indentured servants, experienced high degrees of social defeat and dehumanization. These social conditions have been shown in previous scientific literature to increase one’s likelihood of experiencing substance abuse, depression, anxiety, and other neuropsychiatric disorders (Colyn et. al, 2018, Favoretto et al., 2020, Suvrathan et al., 2014). Labor structures and inter-racial relations also introduced in-group and out-group formation and intergroup bias between social and racial groups, which only continued to create division in Indo-Caribbean society. However, it is unclear how these labor conditions and social cognition effects may influence the health current generations of Indo-Caribbeans.

A scientific field pertinent to studying the Indo-Caribbean diaspora is cultural neuroscience. Cultural neuroscience utilizes an interdisciplinary approach when studying the mind and investigates how brain pathways are shaped by culture (Kitayama and Park, 2010). Rather than studying patients based on their race or ethnicity, these studies group participants together by their cultural identity. This is distinct from social neuroscience because social neuroscience does not typically take into account ancestry, just basic social interactions between people (Cacioppo et al., 2010). Research like this contends that one’s culture affects the development of the brain and how individuals complete even routine tasks. Cultural neuroscience is especially pertinent to the Indo-Caribbean population because although these
people have relatively the same genealogy as their Indian ancestors, the 150 years of separation have caused Indo-Caribbean people to develop their own distinct culture. Indo-Caribbean creole culture developed by merging their native Indian culture with the existent African influences in the Caribbean, leading to the emergence of cultural staples, like a common Caribbean dialect of English, chutney music, and the annual celebration of Caribana. The creolization of multiple cultures has not been previously studied through a neuroscientific lens.

Another pertinent neuroscientific field how the brain may have been influenced by experiencing indentured labor is the semantic atlas model. The semantic atlas model was created to improve understanding of the relationship between semantic stimuli and localized neural activation (Huth et al., 2016). The semantic atlas grouped these words according to semantic contexts, such as social, violence, or place, and associated them with the regions of the brain where there was the most activation when participants were exposed to them. Pertinent to the Indo-Caribbean experience, there was an observed overlap in the regions of the brain activated by both words with a social and violent connotation. This overlap is relevant to the Indo-Caribbean experience because of the violence experienced as coerced indentured laborers and the social importance of marriage within Indo-Caribbean society, which was often arranged and led to high degrees of domestic violence. The semantic atlas with the grouping of “unlike” terms in the same area of activation highlights how much is at stake, for social survival, in finding a secure “in-group” through the “marriage plot.” At the same time, the marriage plot generates caste-based, essentialist boundaries to human behavior and relationships that can generate its own pathologies. These regions of the brain that were activated were explored to understand social cognitive effects of experiencing indentured labor, generational subjugation, and intergroup bias.
My methodology has two parts in order to understand the literary and neuroscientific context of the Indo-Caribbean experience. First, I analyze Indo-Caribbean novels, written histories, and poems to understand the experiences of indentured laborers and their descendants. Then, I explore the relevance of key constructs from cognitive and social neuroscience, like social defeat and dehumanization, that parallel how their experiences were depicted and look at studies on these topics to see how they influence disease prevalence. I also find neuroscientific models and tools, like the semantic atlas, that relate key ideas from each of these fields together.

Chapter 1 outlines the historical context on the indentured labor system in the Caribbean in the 19th and 20th centuries. In chapter 2, I analyze social defeat in relation to V.S. Naipaul’s portrayal of Mohun Biswas in \textit{A House for Mr. Biswas}, and how that relates to current health trends in the Caribbean in regard to substance abuse and depression. Chapter 3 uses Ernest Moutoussamy’s \textit{Aurore} to demonstrate dehumanization’s presence in this indentured labor system and I use recent social cognition studies to show how dehumanization influences brain activity. Social constructs like race, gender, and sexuality, and their relationship with intergroup bias and intersectionality, specifically in the Indo-Caribbean context, are analyzed in chapters 4 and 5. Future directions for this research specifically in the context of global health and cultural neuroscience are outlined in chapter 6.

This thesis establishes a connection between past labor systems and present disease prevalence in the Indo-Caribbean population. By applying literary analysis of Indo-Caribbean novels to modern social cognition studies, this study creates a foundation for future population studies focused on disease prevalence of neuropsychiatric illness in the modern Indo-Caribbean population in order to mitigate these effects in the future.
Historical Context of Indentured Labor in the Caribbean

When examining the plight of Indo-Caribbean migrant laborers, it is essential to place it within the context of the western European colonialism and slave trade, since these were the guiding forces for the surge of indentured labor in the 19th century. At the beginning of the 1800s, after over two centuries of slavery, the forced labor practice was beginning to be challenged. Influenced by the American and French revolutions of the last 18th century, Haitian slaves led the first slave rebellion in 1791, which lasted 13 years until the colony was one of the first to gain independence from France and form the country we know as Haiti today (“Haitian Revolution”). This conflict was able to gain traction because of the vast number of African slaves compared to European colonists. In Haiti, at the time of the revolution, there were 500,000 African slaves and only 32,000 European colonists. Although France had one of the strongest militaries in the world, it was centered in Europe and the physical distance between the Caribbean and Europe caused strain on their colonial power. Despite many losses on both sides of the conflict, this revolution was a startling example for Europe as to what can ensue if there is enough resistance (Buck-Morss, 2009). Buck-Morss writes, “By the eighteenth century, slavery had come the root of metaphor of Western political philosophy, connoting everything that was evil about power dynamics” (21) and this revolution in Haiti would serve as the “crucible of the French Enlightenment” (41), unknowingly substantiating the abstract ideas of these western thinkers, like Hegel, and slowly enhancing the fight for abolition in French and British colonies.

Roughly contemporaneously with the Haitian Revolution, there were many slave uprisings that arose across the English and French colonies, including the Berbice Slave Revolt in Guyana (1763) and Fedon Rebellion (1796) in Grenada (Allen, 2014). These tensions between slaves and colonists led to the abolition of slavery in English colonies in 1833. This was later
followed by the abolition of slavery in French colonies in 1848 (Marsh, 2012). Marsh mentions that although slavery was abolished in these colonies, the need for cheap labor in the colonies was not decreased since the vast amount of profit made for their colonial rulers was through the production of goods, like sugar and rice. Thus, colonial powers, specifically the English and French, began importing a more “ethical” form of labor, indentured servants (The Economist, 2017). Indentured servants were brought primarily from India and China under five-year work contracts that allowed them to have basic living needs, like housing and food in return for labor. This was viewed as more ethical on the parts of the colonists because they were no longer viewing workers as property and were not restricting them to labor for life (Roopnarine, 2003). To avoid colonial uprisings and to appear more moral than its colonial counterparts, Great Britain was the first to utilize the indentured labor system, before France joined them soon after.

Great Britain began indentured servitude during the 18th century as a punitive measure for colonial prisoners (Anderson, 2009). Documents go as far back as 1789 showing that convicts from India were forced out of their country and into other Caribbean or East African colonies where there was a dearth of laborers. Colonies that received Indian workers ranged from Guyana and Trinidad in the Caribbean to Mauritius and South Africa in southeast Africa. These criminals were marked with their name, crime, and date of sentence (godna in Hindi). This system of penal labor was what set up the infrastructure for the massive increase in Indian indentured laborers following the abolition of slavery. This system expanded to encompass any migrant worker, regardless of criminal offense, in 1838 (Mahabir and Pirbhai, 2015). Indian men predominantly were recruited by local colonial officials as workers under the pretense of having a five-year obligation to work the colonial lands before either being allowed to become an independent farmer or return to India. Although the British advertised this as an option, plantation managers
often did not intend on the laborers as having as much land or power as them. Instead, the five-year cycle allowed plantation owners to constantly have a fresh influx of workers available (Roopnarine, 2003). After recruitment, thousands of migrant workers gathered on a ship with no privacy, sleeping quarters, or cooking area. Mortality was a massive problem, with Roopnarine citing 12.39% of men and 18.58% of women dying on the voyage from Calcutta, India to Demerara, Guyana. The statistics were so gruesome that the British India’s Inspector of Government Jails and Dispensaries, Frederic Mouat, actively tried to conceal these statistics from becoming public knowledge (Anderson, 2009). This harrowing journey often formed lifelong friendships between shipmates, creating the terms “jahaji-bhai” (ship-brother in Hindi) and “jahaji-bhain” (ship-sister in Hindi) as they travelled through the kala pani, “black water”. (Mahabir and Pirbhai, 2009). Despite the visible dangers of this voyage, workers continued to be transported throughout the rest of the 19th century and into the 20th century.

After noting the success that Great Britain was having replenishing their workforce with the indentured labor system, France wanted to utilize the same resource (Marsh, 2012). Since France’s colonial empire at the time was not as sizeable as Great Britain’s, they did not have the same number of people from their own colonies to recruit as migrant laborers. Martinique was the first French colony to gain indentured servants in 1853, gaining over 4500 migrant workers by 1858. Yet, France officially was granted the right to recruit British Indians on the same terms as the British after the Anglo-Caribbean Conventions of 1861. Between 1853 to 1889, France, recruited over 76,000 “temporary slaves” from India to their colonies in Réunion, Mauritius, Guadeloupe, French Guinea, and Martinique. Coincidentally, there was conflict between the British and French in the 1870’s after the British claimed that the mortality on the ships heading to the French colonies was too high and needed to be reduced or else their labor agreement
would be voided. This eventually led to the end of indentured servants migrating to French colonies in the 1880’s.

Although French indentured labor ended in the 1880s, the British continued to use the Indian population as a labor resource. Between 1838 and 1917, more than 1,000,000 Indians were brought across the British colonies as laborers (Allen, 2014). These laborers were required to work for their assigned plantations for five years and in return they were entitled to fixed wages, free housing, and medical services (Roopnarine, 2003). These indentured laborers eventually became known as “coolies”, a racial slur symbolizing their inferior social position in the colonies (Bahadur, 2014). After five years, these Indians were given the option to either return to India or become independent farmers, both options were costly and not often feasible. Workers could return to India, but they had to pay their own fare and had to survive the deadly boat ride that killed so many when they first arrived. Many signed up to become workers because there was a want of work in India and they wanted to save up money to bring back home. However, between the low wages and the fees to travel back to India, there would be marginal net profit. Thus, many decided to stay and continue working for low wages in hopes of saving enough the build their own house or own a plot of land. As indentured servitude continued, the world was changing continuously as the 20th century began. Over time, the profitability of indentured servants declined as Western Europe entered the Industrial Revolution. Along with this, Indian nationalists began to spark tensions about the British’s business practices with these laborers, which eventually led to the termination of the Indian Indenture system in 1917 (The Economist, 2017).

Despite indentured labor in India only existing widespread for around 80 years, there are major sociocultural impacts of this practice on the Indian diaspora today. Since the first
indentured laborers were prisoners, descendants of indentured laborers are often associated with potentially originating from criminals. However later on, indentured labor became voluntary and only enacted after the worker signed a contract. Normally only those low in the caste system were inclined to join the British in order to potentially find wealth and success elsewhere. The caste system was heavily rooted in social culture in India, and it was believed that once you left India, your ties to your social caste were now severed (Bahadur, 2014). Although some used caste as a social system in their colonial destinations, many did not return to India consciously after their contract was up because they knew that their social connections to their caste in India were either severed or at least tarnished (Roopnarine, 2003). Thus, in the almost 200 years since the Indian Indenture system began, there has only been growing distance between the Indian diaspora and the Indo-Caribbean and Indo-African diasporas because of the associations with crime and low-caste and the loss of social affiliations once leaving India.
Naipaul’s Maison: The depiction of social mobility and social defeat in V.S Naipaul’s *A House for Mr. Biswas* and its neurological implications

**V.S. Naipaul’s Life and Impact**

V.S. Naipaul, Indo-Trinidadian Nobel Prize Laureate, spent his literary career portraying the experience of living in Trinidad following the cessation of indenture there in 1917. The Nobel Prize committee awarded him this recognition because of his ability to “unify perceptive narrative and incorruptible scrutiny in works that compel us [the readers] to see the presence of suppressed histories” (Nobel Prize, 2001). To this end, many of his novels, like *A House for Mr. Biswas* and *Miguel Street*, expound upon his personal experiences growing up while adding fictive elements to the plot that correlate with the sociocultural context of the time. *A House for Mr. Biswas* specifically grapples with the questions of what it means for someone to be truly independent and whether that is possible or not given the constantly evolving social framework of a country based on colonial labor and influenced by western culture. Integrating Naipaul’s life story and the stories of his fictive characters, establishes a clear, multi-perspective point of view of the sociocultural contexts of post-colonial Trinidad, and some crucial elements of migrant experience in the Caribbean as a whole.

V.S. Naipaul was born Vidiadhar Surajprasad Naipaul, to an Indo-Caribbean family. His grandparents were indentured laborers for the sugar plantations in Trinidad and migrated during the 1880s. Naipaul’s grandparents were indentured laborers from India. Naipaul’s father, Seepersad Naipaul, a contributing journalist for the *Trinidad Guardian* striving to achieve fiscal independence, served as the inspiration for his critically acclaimed novel *A House for Mr. Biswas*. His career and his reverence for writers influenced Naipaul’s career trajectory.
Naipaul spent the first twenty years of his life in Trinidad before moving to the United Kingdom, where he had access to premier educational resources. Since Trinidad was still a British colony during his childhood, Naipaul attended British-run public schools in Trinidad, before receiving a government scholarship to attend Oxford for university. It is through this platform that he began to build his writing career and publication networks. He succeeded in having his writing published and read by a widespread audience compared to his other Indo-Caribbean peers. This allegiance with the culture of nations that were the culprits of colonialization and indenture often causes Naipaul to receive criticism as his case implicitly suggests that in order for an Indo-Caribbean person to be successful, they must in some way be elevated by Western society and its elite institutions (Phillips, 2001). He has said comments openly minimizing the complexity of Trinidad specifically saying in 1980, “I can't see a Monkey - you can use a capital M, that's an affectionate word for the generality reading my work... These people [Trinidadians] live purely physical lives, which I find contemptible... It makes them only interesting to chaps in universities who want to do compassionate studies about brutes.” This theme is repeated in many of his novels, including his chef d'oeuvre, *A House for Mr. Biswas*, where Mohun’s children attain social mobility because of attending British universities. Whether he intended to idealize the West or not is unclear. What is clear is that this Nobel prize-winning writer whose ancestors were Indian migrant laborers reached a wider audience for the fictional representation of Indo-Caribbean life than had ever been reached before.

*A House for Mr. Biswas*

*A House for Mr. Biswas* is largely based on Naipaul’s father, the son of indentured laborers. The novel was published in 1961, a year prior to Trinidad’s independence. Throughout the novel, the reader follows Mohun Biswas, who was from birth predicted to be an unlucky
person by the local Hindu pundit for having been “born the wrong way and facing a future as a leecher and a spendthrift’ (Naipaul 15-17). The social power of spirituality is pervasive throughout the first portion of the novel, as Mohun’s parents obediently believe the predictions of the pundit and try their best to keep him out of trouble. This could be linked to the idea that Mohun was a second-generation Indo-Trinidadian and one of the links that kept his family connected to their Brahmin roots in India was their religion. Brahmins, according to the Indian caste system, are the highest social caste whose role is to be the religious and intellectual leaders of society (“People Groups”, 2015). Although these migrant workers of superior caste in India were not explicitly recognized in their new labor-based contexts where all workers were at the bottom of the local social order, caste still implicitly influenced social behaviors within different migrant sub-groups (Anderson, 2009). As members of the Brahmin caste, Mohun’s family members still adhere to the spirituality associated with Hinduism. This attachment to their spirituality eventually resulted in Mohun’s father passing away in an effort to save his son. This occurs when Mohun falls into a body of water and almost drowns until his father saves him, only for him to die as a result. In this early phase of the novel, Mohun’s experiences are based solely on his nuclear family and the power dynamics are mostly established between him and his parents and his family and religion.

Once Mohun’s father passes away, Mohun and his family moves in with his mother’s sister, Tara, where he continues his education and discovers his love for English and journalism. Eventually, Mohun is thrust into adulthood since the fiscal constraints of his family require him to work at an early age. After briefly training to be a religious pundit under Pundit Jairam and working at his uncle’s brother’s rum shop, he finds a job as a sign-painter. During this time, his innate desire (which pervades the rest of the novel) to become an independent man with his own
house is formulated. His job as a sign writer is in a way the first time that he is given a voice and has the ability to depict ideas, through advertising images and slogans, relatively autonomously. While working he reflects, “But he never ceased to worry. He no longer simply lived. He had begun to wait, not only for love, but for the world to yield its sweetness and romance” (Naipaul 76). As a sign writer, he no longer passively lived, he became determined to make something of himself. Following this reflection, he becomes arranged to marry Shama Tulsi, a member of the prestigious Tulsi family. This is determined on the basis of his caste since he was born into a Brahmin family. Again, as a displaced society, the Indo-Trinidadian community clung to the social hierarchy that was established in India. The Brahmins were of the highest social and moral standing and thus were eligible to marry into the majority of Brahmin families in India, whether or not they had fiscal wealth, as in Mohun’s case. In some accounts of the Indian indenture system, such as the biographical book *Coolie Woman*, the departure from India is assumed to entail an erasure of caste, since once they entered this new land, everyone, regardless of social caste, was working under the British. Bahadur writes “New hierarchies emerged across the dark waters. In the plantation’s ranks, the sirdars or drivers in charge of work gangs – who came from all castes, including Untouchables, had privileges that made them attractive to immigrant women” (Bahadur 92). These “new hierarchies” emerged during the age of indenture in the early 1900’s when caste was starting to be overshadowed by colonial socioeconomic status. In Naipaul’s novelistic account, this adherence to caste may be so stringent in contrast to Bahadur’s account because of Mohun’s high caste. Those of higher caste wanted to cling to any semblance of elevated social status in this new labor status, compared to lower caste members who wanted to shed this indicator of social ostracization.
Immediately after marrying into the Tulsi family, Mohun moves into the Tulsi family’s house, colloquially called the Hanuman House, where he becomes dependent on his wife’s family for fiscal support. The name of the house is a nod to the Hindu faith, since Hanuman is known as the protector of the Hindu deities. The name Hanuman House would signify that Hanuman is also protecting whoever lives in this house, however for Mohun all he ever aspired to do was escape this “protection”. This dependance takes a toll on Mohun and further increases his desire to succeed. This theme is also prominent because in traditional Indian culture; it is the husband’s family that is supposed to welcome the wife into their family and support her and her children. This demonstrates how Mohun’s life circumstances consistently put him in a place of social weakness. Despite caste signifying high social status, this did not guarantee him a proper education or fiscal success. In comparison to the Tulsis, who are of the approximate social caste of Mohun, his family did not have secure income or a plot of land that he could rely on. This demonstrates that after the cessation of indenturement, aside from clinging to the traditional Indian values, the Indian diaspora began to develop their own forms of socioeconomic disparity. In addition to the traditional social caste hierarchy, this new form of social hierarchy was forming in post-indenturement British colonies based on fiscal success (Roopnarine, 2003). While families like the Tulsi’s formed businesses and stable forms of income, other families like the Biswas accrued wealth at a slower rate.

Although Mohun has been brought into this affluent family through marriage, this only fuels his aspiration to become a fiscally independent man and not depend on his in-laws. In contrast to the massive Hanuman House in which he lives, he hopes to just gain any form of property for himself and his family, hence the namesake of the novel *A House for Mr. Biswas*. For Mohun, although he is the grandchild of the original migrant workers, he still has not been
able to receive or establish any form of generational wealth, like in the form of property, like the Tulsi family has been able to. When describing Biswas’ childhood, Naipaul writes, “Mr. Biswas never went to work on the estates. Events which were to occur presently led him away from that. They did not lead him to riches, but made it possible for him to console himself in later life with the Meditations of Marcus Aurelius, while he rested on the Slumberking bed in the one room which contained most of his possessions (23)”.

His bed and its immediate vicinity accounted for the vast majority of what Biswas could consider his own growing up and that did not change drastically as he came into adulthood. The metaphor of the “Slumberking” bed demonstrates the symbolic nature of marriage and the domestic sphere as key to social mobility. Although Mohun marries into a wealthy family, he is never truly admitted into the inner circle of his in-laws and their bourgeois status. In Coolie Woman, Bahadur further examines the life of her great-grandmother who immigrated from India to Guyana and how her family was able to sustain themselves for three generations before immigrating in the 1980’s. In the written history, she describes her family working on the same land they had worked on as indentured laborers while saving their money living in the mud and grass houses that the British had originally provided for them. Bahadur describes that wages as “they should not be underestimated as a regular, reliable source of income. Nor should they be overestimated as a source of independence (Bahadur 91)”.

This same predicament is what Mohun faces as he attempts to provide for himself beyond just making ends meet. This idea of gaining property for Mohun is paralleled to creating the degree of independence and financial security that his ancestors either had or aspired to have in India, a land that he was no longer physically connected to.

Naipaul’s depiction of Mr. Biswas could be viewed as the representation of the modern post-colonial man, who takes the initiative to find success no matter the barriers in a way that
parallels the archetypal American Dream. Previous generations would have not necessarily had the opportunity or tenacity to try multiple careers from a sign writer to a newspaper columnist or attempt to build a house numerous times and fail. Traditionally, men in Biswas’s position would have followed adhered to social cues of the time and followed in the Tulsi tradition of working for their family business and contributing to their wealth instead of branching out and following his passions. This is shown throughout the novel by the reactions of his family members whenever he attempts to own his own house. For instance, when Mr. Biswas and his family move into the incomplete house while he is working as a driver in Green Vale, his wife, Shama frequently returns to her parents’ home. So much so that, “he [Mohun] never ceased to feel that he was alone, with the trees, the newspapers on the wall, the religious quotations, his books. One thing gave him comfort. He had claimed Savi [one of his daughters] (Naipaul 217).” This demonstrated that even though he strived for fiscal independence, he was not openly supported by his wife and in-laws who favored already existing success rather than creating one’s own wealth.

Mr. Biswas is continuously personified as a character who is ambitious to be successful based on his own hard work, yet his family and society as a whole act as his biggest barriers to success. Naipaul depicts Mr. Biswas as a flexible worker who constantly adapts to what occurs in his life. From being born under a grim prophecy and being implicitly blamed for the death of his father to having his house destroyed multiple times and being scammed by the solicitor’s clerk, Biswas remains persistent in his desire to have his own house. However, at the end of the novel, Mr. Biswas is still without property, not because of his lack of tenacity but because of the corrupt nature of the society. It is clear that colonial Trinidad is not a meritocracy. Even as indenturement ends in colonial Trinidad, equal opportunity still does not exist for all migrant
workers. Those who were able to accrue money during the British reign still had the most socioeconomic control, prohibiting others from improving the living conditions for lower class people.

Education is a pervasive theme throughout the novel. Biswas is unable to have a proper education because his father passed and even though the Tulsi family is affluent they do not seem to have a high level of education because of the colonial restrictions on what forms of education were available to people of color at the time. Mr. Biswas demonstrates the importance of college because he says, “Whatever happened, Anand [his eldest son] would go to college. It wouldn’t be easy, but it would be cruel and foolish to give the boy nothing more than an elementary school education” (465). In the novel, one of the only moments of pride Mr. Biswas feels is when his son, Anand, outperforms the majority of Trinidadian students and receives a scholarship to attend university in the United Kingdom. Anand, who is modeled after V.S. Naipaul, even outperforms those from wealthier families, including the Tulsis. Naipaul uses education as one of the only facets of life in colonial Trinidad where there is a true meritocracy since scholarships are determined solely by test scores, rather than by social status. However, it should be noted that poorer families are solely restricted to using scholarships to attain higher education because of the high cost of tuition. Wealthier families were able to readily send their children to England for education, as Mrs. Tulsi sent Owad to Cambridge to study medicine, presumably without a scholarship. Although Trinidad’s first university, the University of the Southern Caribbean, was founded in 1927, it was not nearly as developed as its British counterparts, like Cambridge and Naipaul’s alma mater, Oxford.

The impact of education is demonstrated at the end of the novel when both Owad and Anand attain equal higher social status because of their education. Although they were born into
different families, once they return to Trinidad from their studies in England they are equals because of their education. However, Naipaul does show a preference towards the intellectual integrity of Anand during his dispute with Owad when they have dissenting opinions on European art. Although this debate begins over aesthetic differences, it leads to major conflict between Owad and Anand, leading to a physical altercation. By presenting Anand with the more refined opinions, Naipaul is indirectly showing that even though Owad has higher pedigree based on birth, Anand has achieved superior intellect and taste. Similar to his own life, Naipaul uses education as the primary method of elevating oneself, especially those born under the subjugation of colonialism.

The novel concludes with Mr. Biswas’s goal of attaining property as unfulfilled. After his house has unexpected defective parts, he is forced to move back to the Hanuman House, the house that he has spent his entire adult life trying to move out. Perhaps, this is a play on Mr. Biswas’s ‘inconspicuous birth’ (Naipaul 15), that even though he had a continuous tenacious work ethic, his fate was not to succeed. However, his son is able to find success through education abroad, and his daughter’s crafty nature allowed her to learn how to manage what was left of her parents’ finances as they become older. The novel ends with Mohun Biswas passing away in the Tulsi residence with little acknowledgement by anyone aside from his wife’s siblings that pay their condolences because of the social obligation.

*Intergenerational Trauma*

One of the key themes throughout the novel is family and the intergenerational impact of indentured labor. The relationship between Mr. Biswas and his children demonstrate how social class persists for multiple generations. For instance, although Anand, Mr. Biswas’ son receives the same education as Owad, the Tulsi’s son, Anand never receives that same amount of respect
as Owad and is even slapped multiple times by Owad when they have an intellectual argument. Thus, the traumatic experiences of Mr. Biswas, as a grandson of indentured laborers, must have influenced his life experiences. Intergenerational trauma was originally studied in terms of Holocaust survivors because it was found that children of Holocaust survivors who were born after the end of World War II anecdotally displayed symptoms of psychiatric illness (Rakoff, 1962). A wide range of attributes were reported including impaired self-esteem, traumatic nightmares, experiencing anxiety, and other neuropsychiatric symptoms. This study was reinforced with biological research on intergenerational trauma, and it was shown that offspring of Holocaust survivors were more likely to have hypothalamic-pituitary-adrenal (HPA) axis alterations that were similar to those that experience post-traumatic stress disorder (PTSD) via lower cortisol levels and enhanced glucocorticoid receptor responsiveness (Yehuda et al., 2002). These same effects were observed in offspring of mothers who experienced child abuse (Schreuder et al., 2016). These effects are thought to occur via epigenetic modifications to the offspring’s DNA as a result of the parent’s traumatic experiences. Epigenetics refers to “a set of potentially heritable changes in the genome that can be induced by environmental events. These changes affect the function of genomic DNA, its associated histone proteins, and chromatin, but do not involve an alteration of DNA sequence” (Yehuda and Lehrner, 2018). These changes most often occur through the methylation of regulatory regions that may silence or promote specific genes, which could affect protein production downstream. In terms of intergenerational trauma, based on biological research, the 1F exon promoter is of particular interest in the glucocorticoid receptor gene, which may account for some of the neuropsychiatric effects found in offspring of parents who have experienced trauma (Palma-Gudiel et al., 2015). However, there have not been any specific epigenetic markers that are specifically linked to the development of
PTSD (Yehuda and Bierer, 2009). The prevalence of PTSD in Indo-Caribbean nations, like Guyana, is largely unknown. Most of the studies investigating parental transmissions of trauma have focused on mothers because all of their eggs are created at birth, so they are present during any form of childhood trauma. On the contrary, for males, spermatogenesis occurs from the onset of puberty until death, so these sperm cells are not alive during previous experiences of trauma, so it may be less likely to have epigenetic markers of trauma or abuse. No studies have been undertaken to investigate transgenerational effects of trauma through sperm transmission, but diet, drug usage, and stress levels have been shown to influence a male’s offspring (Fullston et al., 2013, Anway et al., 2005, Friedler et al., 1996).

The descendants of indentured workers may experience similar effects; however, studies have not extended to generations beyond direct offspring to see if effects disappear after the first generation or if the effects rise or decline over time. However, there have been studies that demonstrated that grandparents who experienced famine had influenced their grandchildren’s metabolic processes. For instance, grandparents who experienced famine had grandchildren that were more likely to have diabetes since their bodies were less acclimated to the consistent access to food, since their grandparents needed less insulin since their bodies processed less sugar. This effect also appeared to be sex-specific, so grandfathers only influenced their grandsons, and grandmothers only influenced their granddaughters (Kaati et al., 2007). For instance, if a paternal grandfather experienced famine, his grandsons had a higher likelihood to have diabetes because their metabolic processes were influenced by the lack of the food availability two generations ago. Thus, there has been some evidence for how one’s traumatic life experiences can influence the physiological processes of future generations.
Mohun Biswas embodies a social group that is continuously ostracized and isolated from success no matter his effort. Biswas came from a humble family of migrant workers from India that worked under the British to maintain their plantations and provide profit for the British empire. After indenturement, Biswas was born into a socio-economically disadvantaged family that was never able to allocate wealth or professional success, especially after the early death of his father. Eventually when Biswas is married to the wealthy Tulsi family, he is often separated from the rest of the family because he attempts to make his own wealth and buy his own house, which is met with numerous challenges. By the end of the novel, he dies without fulfilling his goal and gains little genuine social support from his family, embodying his experience as a member of a socially-constructed out-group.

There have been numerous studies in rodent models that have investigated how this form of social defeat can influence one’s brain function, which could be pertinent to the disease prevalence of the population that Mr. Biswas represents. In order to examine the effects of chronic stress in the most ethically feasibly way, it is common practice to utilize rodents as models for chronic social defeat stress through a 10-day social defeat protocol (Shimamoto, 2018). In this protocol, naïve mice intrude into a home cage where another mouse has already established territory. This resident-intruder paradigm can be used for both sexes of mice in order to understand these chronic social defeat mechanisms. Social defeat stress leads to autonomic and endocrine responses influencing impairment throughout the brain and body. When compared with control mice, mice that experienced chronic social defeat stress demonstrated a depressive-like phenotype, shown by a reduced preference for sucrose, which represents a heightened degree of anhedonia, and social inhibition (Macedo et al., 2017). Also, these chronically stressed...
mice demonstrated heightened anxiety-like behavior in the elevated-plus maze. However, these mice had a heightened corticosterone response when presented with ethanol, an addictive substance. Compared to control mice, the reward network response was heightened when exposed to ethanol, especially after the first instance social defeat. The conclusions from the Macedo et al. study are supported by numerous other studies that demonstrated similar results in regard to ethanol response in chronically socially defeat mice and extended to additional addictive substances, like cocaine and opioids (Favoretto et al., 2020, Newman et al., 2018). It was additionally discovered that defeated mice had decreased levels of serotonin and dopamine in the brain and that even when exposed to ethanol, the defeated mice released smaller amounts of dopamine in comparison to control mice. This imbalance of monoamine levels in the frontal cortex may be what contributes to the socially defeated mice to have an increased tendency to experience ethanol dependence. Specifically, it is hypothesized that adaptations in corticotrophin-releasing factor (CRF) and CRF modulation of monoamines, like serotonin and dopamine, in the ventral tegmental area and the bed nucleus of the stria terminalis, may cause the increased tendency for drug dependence in socially defeated animal models (Newman et al., 2018).

Studies on these chronically distressed mice also showed that there may be some neural alterations that are made in the brain, specifically in the prefrontal cortex, amygdala, and hippocampus as a result of chronic social defeat stress (Colyn et al., 2019, Patel et al., 2018). The areas that are most drastically affected are those processing emotions. For instance, for those mice experiencing chronic social defeat stress, it was found that neuronal spine densities from pyramidal cells in the prefrontal cortex are decreased while there was an increase in dendritic arborization in the basolateral amygdala (BLA). These observed changes resulted in increased
social avoidance behaviors when exposed to fearful stimuli. This correlates with studies on rodent models experiencing major depressive disorder, in which there were also observations in alterations in dendritic and synaptic structures in the prefrontal cortex and BLA (Maren and Quirk, 2004). These dendritic changes enhance fear responses by forming new synapses and promoting long-term potentiation in the amygdala (Suvarthan et al., 2014). It is unclear if experiencing chronic stress is specifically causal in these microanatomical changes, but in the mice models where these changes were observed the only factor of their environment that was changed was their chronic stress level. In addition, in the hippocampus, in rodent models after experiencing social defeat stress for five consecutive days, mice showed clear social avoidance behavior and dendritic atrophy in the CA1 region of the hippocampus, showing divergent synaptic behavior between the hippocampus and amygdala (Patel et al., 2018). This same change in synaptic morphology seen in socially stressed rodents is similar to the changes seen when rodents are presented with physical stressors, demonstrating similarities between physical and social stress.

The impact of discrimination on certain demographics has only been recently studied through animal studies and within racial groups in areas, where there has been a history of racial segregation. The conclusions from these studies signal the effects colonialism, imperialism, and indentured labor may have had on the populations subjugated. A key theme in *A House for Mr. Biswas* is the social isolation that Mr. Biswas faces from the Tulsi family throughout his endeavor to achieve fiscal independence. A study at the Dimence Institute for Mental Health in the Netherlands investigated the effects of social exclusion in a population of Moroccan-Dutch migrants. Although their sense of exclusion involves a difference in race and skin tone, both experiences are rooted in the idea that one group is considered an in-group, “a social group that a
person psychologically identifies” (van de Beek et al., 2017) and out-group, a social group that a person does not psychologically identify. In Mr. Biswas’s society, the in-group is the Tulsi family and their wealthy peers, while Mr. Biswas is singled out even from his wife and children as part of a subconscious out-group because of his socio-economic status and cavalier ambition to make his own wealth. Similarly, in this study the native Dutch people are the in-group because they have the higher socio-economic and social capital than the Moroccan immigrants, who make up the out-group (van de Beek et al., 2017). It has been shown that people and animals are subconsciously inclined to favor those within their own in-group (Masuda and Fu, 2015). Within the Moroccan-Dutch population, it was found that 50% of the 267 participants screened positive for depressive symptoms and psychotic experiences. There were significant associations between the screened depressive symptoms and signs of social defeat and psychotic experiences. However, these signs decreased as social support and higher education increased (van de Beek et al, 2016). In the novel, there was no specific mention of mental illness, yet there are signs of loneliness and separation that Mr. Biswas mentions. Like the studies suggest, when he acquires his first house when he is a driver at Green Vale, his wife and two of his children do not live with him and instead decide to live in the Hanuman House. He does show compassion for his dog Tarzan and son Anand who decides to stay with him and who seems to save him from his growing loneliness and sense of failure. This correlates with the study’s findings that with social support, there seems to be weaker signs of psychopathology illness, which may arise from the idea that the social support found within one’s own in-group can balance out the avoidance expressed within one’s out-group (de Dreu, 2010).

In regard to the prevalence of in-group formation and the perception of Indian indentured laborers as a social out-group, there has been a study that constructed a semantic map of the
brain in response to naturalistic language (Huth et al., 2016). Participants were placed in an fMRI and listen to segments from National Public Radio’s *The Moth Radio Hour*, and the investigators tracked the functional activation of the brain as specific words were presented to the brain. The semantic atlas model has its limitations because there were only seven subjects, who were all monolingual college students.

Therefore, a wide range of ages, educational backgrounds, and lived experiences are excluded from the results of this study. In addition, the context of the presentation of these individual words was not directly factored into the processing of the data. The brain processes language based on the linguistic context, so looking at one word at a time may not lead to the most effective pattern formation of activation. However, this semantic atlas model has been groundbreaking in understanding how semantic stimuli affect the activation of specific regions of the brain bilaterally. This model can help us understand which parts of the brain have increased activation due to lived experiences centering.

In particular, I focused on the social and violent categories of terms because of the stringent social nature and the centrality of the family in Indo-Caribbean community and also the violence that was present in almost all sociocultural structures in this community. The intersection of these two categories were found in the semantic atlas model and were the most pertinent regions to our understanding of how the brain could be affected by the violence enacted based on the labor and social structures in the Caribbean. The social structure of Indo-Caribbean society was centered around marriage, specifically marrying someone of the same race, religion, and caste, and any violations from this caused large social rifts. This aligns with the ‘marriage plot’, coined by Dr. Jean Dejean, that marriage is a social device, in which people are supposed to marry the person that optimally matches their social-economic status or better, specifically for
women. This can be seen across cultures with dowries and debutantes constructed to present the worth of women in exchange for marriage. This Indo-Caribbean society is no different in terms of the capacity for the groom to provide and the bride to be dutiful and to mother being the primary qualifications for marriage in addition to one’s family lineage, race, caste, and socioeconomic status. Thus, this causes conscious discrimination against one’s race, caste, and other social demographics that are not their own when looking to marry and start a family. Even though Biswas does fulfill the marriage plot by marrying into the Tulsi family, he still does not feel a part of the family and faces continuous judgement and social isolation throughout his marriage. This rift is shown in the Mr. Biswas’ depiction of his wife, Shama’s behavior when she begins to show signs of pregnancy. Naipaul writes, “When her feet began to swell, Mr Biswas wanted to say, ‘Well, you are complete and normal now. Everything is going as it should. You are just like your sisters.’ For there was no doubt that this was what Shama expected from life: to be taken through every stage, to fulfill every function, to have her share of the established emotions: joy at birth or marriage, distress during illness and hardship, grief at a death.” Life, to be full, had to be this established pattern of sensation. Grief and joy, both equally awaited, were one. For Shama and her sisters and women like them, ambition, if the word could be used, was a series of negatives: not to be unmarried, not to be childless, not to be an undutiful daughter, sister, wife, mother, widow (Naipaul 153). Biswas’ predominant ambitions are rooted in forging his own path to success while this description depicts Shama as one who wants to follow the exact status quo and do what is expected of her, as a mother and wife. “Mother” and “wife” were key words in the social semantic category, and “death” was a key word in the violent semantic category. In this citation, it is pertinent to note that these terms are used as opposites; if Shama were to fail as a mother and sister, the result would be a sense of being a failure at living. In
future sections, I will analyze the specific cortical regions that make up this social and violent overlap activation.

In *A House for Mr. Biswas*, Mohun Biswas constantly strives to escape the low socio-economic class that he’s born into because of the indentured servant system. Despite maneuvering numerous careers and multiple failed attempts at acquiring property, he dies in the same house that he has tried to escape since he gets married as an adolescent. It is disputable whether or not Mr. Biswas experiences social defeat stress in this novel. Social defeat stress is stress in “subordinate animals [or humans] caused by social defeat during social confrontations (Blanchard et al., 1984) and after results when that subordinate animal or human loses in a social confrontation interaction (Shimamoto, 2018). In *A House for Mr. Biswas*, the social confrontation is between the social class that Mohun Biswas represents and the high socioeconomic classes that gain wealth following the fall of indenturement in 1917. He continues to strive for success until he realizes the home he acquires has malfunctioning parts, which is when he accepts his fate and lives the rest of his life in the Hanuman House. They can also increase tendencies for addiction because of this increased perceived reward. Through different durations of social confrontation with different series of mice, there was a positive correlation between the increase in duration and the increase in perceived reward and addiction potential (Favoretto et al., 2020, Patel et al., 2018). In addition, in *Coolie Woman*, Bahadur writes of Guyanese society, “indentured men drank [alcohol] as a strategy for survival, to make bearable the harsh conditions on plantations. Alcohol, consumed in the company of mates, downed with the equally downtrodden, became their escape when the promises of recruiters proved illusory (203). This dependence on alcohol to cope with one’s living circumstances could be the origin of the modern prevalence of substance abusers within the Indo-Caribbean community. Today this is
still prevalent with a study reporting that 37% of a sample of 1837 households in Trinidad reported consuming alcohol on a heavy episodic basis in 2017 (Maharaj et al., 2017).

In addition to a narrative about social mobility and the standard of living for the descendants of migrant workers in colonial Trinidad, *A House for Mr. Biswas* also portrays the life of man constantly isolated from society striving to find his own sense of success and acceptance. Due to the social structures in place in colonial Trinidad, he is never able to accomplish this. This has caused signs of social exclusion and social defeat, which has been shown to cause and increase in psychopathological illness and increased reward, which increases addiction potential and substance abuse rates in the lower-class Indo-Caribbean population.
Caste, Migration and Indentured Labor: Dehumanization through indentured labor and intergroup bias in Ernest Moutoussamy’s *Aurore*

Indo-Caribbean Indentured Labor in French colonies

After the abolition of slavery in the French empire in 1848, the French government needed an efficient and cheap way to continue the agricultural labor that the newly emancipated slaves had done for free for numerous decades. The majority of the labor involved producing agricultural goods and natural resources from France’s tropical colonies in the Caribbean and Eastern Africa, which produced a large portion of the monetary profits for the French Empire (Marsh, 2012). The British empire faced a similar problem when they illegalized slavery in their own colonies in 1833. Their solution was to adapt the practice of inexpensive labor through indentured servitude, specifically of Indian and Chinese colonists. Modern day India and China were facing unemployment and poverty due to their high population sizes, so their populations were susceptible to signing five-year work contracts that took them to other British colonies for work for low pay (Roopnarine, 2003). This led to the displacement of over a million Indian people to eastern Africa and the Caribbean, which led to the continued profitability of the tropical British colonies with little increase in cost to the British Empire. The French yearned for the same fiscal success as their British rivals, however they did not have access to large colonial populations like the British did in India and China. This led to a French treaty with the British in 1861, that allowed them access to Indian workers to manage the land in their colonies (Anderson, 2009). This contract led to the massive increase in the Indian population in modern day territories of Martinique, Guadeloupe, French Guiana, and Mauritius. In *Aurore*, Ernest Moutoussamy depicts the migration of an Indian couple from the Pondicherry region of India, an area of south India with heavy colonial French influence, to Guadeloupe, a French Caribbean
territory, as indentured workers in hopes of escaping the caste system that seemed to bar them from pursuing their love and their dreams. Instead, they find themselves in yet another restrictive social structure within the French indentured labor system.

Ernest Moutoussamy

Ernest Moutoussamy was born in Saint-François, Guadeloupe to a family with Indian origins. He was an influential Indo-Guadeloupean author and politician. Aurore depicts a fictitious account of a migration journey similar to the one experienced by his ancestors. In contrast to many English colonies, Guadeloupe is not an independent country, but rather an overseas French territory, so it does not have an independent government. However, Moutoussamy was been elected to the Communist Party of Guadeloupe in 1981 and as Mayor of Saint-François from 1989-2008 (Anderson, 2009). His literary works all contribute to increasing the exposure of the Indo-Guadeloupean experience and the literary phenomenon of indianité, which explores the unification of the entire Indian diaspora. These voyages contributed to the demographics of Guadeloupe because today 15 percent of the population is of Indian origin (World Population Review, 2020).

In contrast to A House for Mr. Biswas, Aurore was written in 1987, decades after the wave of independence that spread throughout the Caribbean in the 1960’s that led to the independence of most Caribbean countries from their mother nations. It has been noted that Moutoussamy is one of the first authors to depict the French perspective to the Indian indentured experience, which has been predominately explored through a British lens (Anderson, 2009). The term indianité originated with Gilbert Ponamen, who recognized that Indo Franco-Caribbean people were not gaining recognition as Creole people in their respective rite compared to the African populations (Mohammed, 2017, Mehta, 2010). Ponamen’s ideas of indianité were often
compared to those of Aimé Césaire in regard to negritude and unifying the African diaspora. Moutoussamy expanded indiannité through his novels because he hoped to increase the racial and cultural diversity in the depiction of Créole people. He explores the prevalence of divisive racial relations between the African and Indian people in Aurore once Rama arrives in Guadeloupe, which precedes the racial tensions that arose in modern nations, like Trinidad and Guyana, once they declared independence from Britain (Bahadur, 2015). Although both indiannité and negritude hope to unify their respective diasporas, it has often been viewed as combative towards each other as both racial communities try to create familial connections to the same land.

Aurore

Moutoussamy starts Aurore with the exposition of Rama, a young man a part of the highest social caste, the Brahmin class, in Pondicherry, India in 1884. Rama lives with his family in a house colloquially called the Madevi House with his mother and his relative, Lila. Rama was becoming of marrying age and his mother begins to look for suitable brides for him since they practiced arranged marriage. The Brahmins were considered the most superior social caste because their role was to maintain the moral standing and tradition of the entire caste system. As such, they followed strict rules in terms of who one could marry and have children with in order to have a pure bloodline. This approach to marriage aligns with the socioeconomic approach to marriage, detailed by Dr. Joan Dejean’s “marriage plot”, which discussed how marriage was a socioeconomic device, shown through the pervasive depictions of debutantes and dowries and mechanisms for manufacturing marriages (Dejean, 1991). Rama’s introduced to the namesake of the novel, Aurore, a beautiful, college-educated Brahmin girl who his family picked to be his wife. Although she met all of the criteria of an ideal bride, Rama was infatuated with another girl, Sarah. Sarah was a part of the lowest caste, the untouchables. Due to social barriers, she
lived on the outskirts of Rama’s family’s estate and never formally met Rama before. Rama’s family was bitterly against him marrying her, especially because his father passed away, he was the sole patriarch of the family, which made the purity of who he married even more important. Although he gets engaged to Aurore to please his family, Rama eventually flees his house to elope with Sarah and escape the confines of the stringent caste system that is keeping them apart.

At the start of the novel, Moutoussamy establishes a social division between castes in India, which signals the universality of power dynamics within all Indo-Caribbean. Since the narrative is told through Rama’s point of view, the reader gains his perspective in addition to the privilege his social role gives him. It is clear that Rama is deeply in love with Sarah, but it is not clear what her opinion is of him. In fact, Sarah is often referred to solely as “le paria”, loosely translated to English as “the outcast” at the onset of the novel. In contrast to other love stories regarding social strife, these two lovers have never actually met before Rama runs away from home. Their first meeting is actually a bit anticlimactic, Rama asks Sarah for directions to the Madevi house, asking as if he was a fellow untouchable looking for assistance from the wealthy. She clearly does not recognize him and is instead a bit bewildered to see a stranger, since she lives alone with no parents or siblings nearby. Her first words in the novel are “Fais attention! Elle n’aime pas les parias. Comment t’appelles-tu? (‘Pay attention! She [Lila] does not like social outcasts. What is your name?’)” (43). Even when Rama responds with his name and she notices that he has the same as the son that lives in the Madevi House, she does not recognize they are the same person, which shows that she does not often think of him outside of an aristocratic standpoint. Nonetheless, this conversation warms the spirits of Rama because he started a dialogue. Shortly after, his relative Lila finds out that he has fled the house and escaped his marriage with Aurore. Based on their previous conversations, she realizes that he acted on his
urges to be with Sarah, which was a severe moral trespassing according to her views of how Brahmins should behave. It was clear that Rama’s choice to leave had permanently severed his relationship with his family and his caste. This motivated Rama to be more insistent in attracting Sarah and starting a life together.

Following this tense encounter between Rama and Lila, Rama and Sarah leave the area that surrounds the Madevi House in order to find work. While venturing into the local village, they realize the deficit of work available to them. Rama also begins to understand his previous privilege as part of the Brahmin class and the plight of unemployment for the lower castes. They encounter a local recruiter who is working for the French in order to bring workers to Guadeloupe to work abroad in the sugar plantations. Although Rama is initially suspicious and anxious to leave India, Sarah is enticed by the idea and believes that by leaving India she will also be escaping the caste system that has been oppressing her since birth. Rama and Sarah spend some time pondering whether or not they wanted to pursue working in Guadeloupe. Since this story takes place a couple of decades after the establishment of the French indentured labor system, some of those who migrated sent letters back to India to their families to warn others about their harrowing experiences. Sarah and Rama read one of these letters, which causes Rama’s hesitations to increase. The writes says, "Depuis trente ans, ce sont des dizaines de milliers de frères et sœurs que nous sommes morts dans l’esclavage des champs de canne à sucre. Si le bonheur existait là-bas, ce n’est pas vous qu’on viendrait chercher en profiter… Kala-Pani, terrible malediction, (‘Over the past thirty years, tens of thousands of brothers and sisters have died in slavery in the sugar cane fields. If there was happiness there, it wouldn't be you who would come looking for it ... Kala-Pani, terrible curse’)” (65). Sarah’s motivations to migrate still do not wane after seeing these letters. However, Moutoussamy is continuously
presenting these experiences through Rama’s perspective, so it is unclear if Sarah also has worries but they are just imperceivable to Rama. Although Rama is hesitant to leave India, he is desperate to please Sarah, so he eventually gives in and decides to leave India with Sarah and venture to work in Guadeloupe.

Isolation and the desire for social support play a large role in both Rama and Sarah’s desire to leave India. Although Rama initially romanticizes Sarah from his privileged vantage point in the Madhuri House, he quickly realizes how difficult her life is when he is left to fend for himself. Her instinctive desire to leave India is rooted in the fact that no one is there to support her in India solely because of the social class that she was born into. Her hope for moving to Guadeloupe is to finally have some form of community so that she does not have to be solely independent. She mentions this to Rama when pleading him to come to Guadeloupe when she says, “Je veux vivre ailleurs. Nous passerons notre lune de miel là-bas. Le destin m’appelle dans ces pays lointains. Cette société m’a trop écrasée. Je veux engloutir ma malédiction dans les eaux des océans (‘I want to live elsewhere. We will spend our honeymoon there. Fate calls me to these distant lands. This company has crushed me too much. I want to swallow my curse in the waters of the oceans’)” (64)! Based on her remarks, she wants to escape the social scrutiny by any means necessary, even if that means signing herself to work in Guadeloupe. For Rama, he is more hesitant because until very recently he had total social support and familial protection. Nevertheless, once it came to pleasing Sarah, the only person he had left after leaving his family’s home, he also had to ignore the warning signs and decides to board the ship, L’Aurelie, for Guadeloupe. Upon boarding Moutoussamy reflects on the setting, “Réveillé et vindicatif, le jeune homme confia aux nues les abominations de son destin et largua toutes ses recettes pâlies et romantiques (‘Awake and vindictive, the young man confided to the skies the abominations of
his fate and threw away all his pale and romantic thoughts.’) (75)”. Even as Rama and Sarah are leaving India in an effort to escape the caste system that kept them apart, the reader can already see that these upper and lower caste mentalities stick with them as they leave India.

Aboard the L’Aurelie, Rama and Sarah are separated often because men and women sleep separately. Sarah immediately acclimates better than Rama because even though the living conditions were extremely difficult, she was able to form a sense of comradery with some of the other migrants. The term often used to describe this relationship is “jahaji-bhain”, which loosely translates to “ship sister” in Hindi. Normally, men became indentured servants in order to start a new life for themselves or to earn some money to eventually bring back with them to India when their contract was over. At first, women did not migrate primarily because their social roles were as wives and mothers, and those roles were not necessary in Guadeloupe and other colonies. However, due to social subjugation, like what Sarah experiences, women also made the voyage to escape their social status and to start anew. The British empire also realized the necessity of women in the colonies in order to have the next generation of workers in the Caribbean. Due to their minority status, they were often subject to physical and sexual harassment by their male counterparts both on the boat and in their new homes (Bahadur, 2014). This abuse and their minority status bonded the women together stronger than the men. On the contrary, Rama has a much more difficult time acclimating because he is with people who are socially beneath him in the caste system, and the conditions of the ship are drastically different than what he is used to growing up in the Madevi House. This degree of separation from the rest of his peers on the ship grows when Sarah eventually succumbs to sickness and passes away on the ship while still on their way to Guadeloupe. This death, while one of many that occur on the voyage, shakes Rama because he loves her and the only person that he knew when coming on the ship and the main
driver for his migration was now gone. Although before his regret about leaving India was somewhat veiled when Sarah was alive, after she passes, it becomes very clear that he realizes that he has made a mistake.

After months aboard L’Aurelie, Rama arrives in Guadeloupe. All of the workers aboard the ship were individually hired by plantation owners based on their gender, stature, and physical fitness. Since Rama was a single, young man, he was the ideal candidate for labor. Rama chronicles his monotonous experiences working for the plantation and the unequal treatment between the African workers and the white plantation owners. Due to the 1848 French legislature that illegalized the use of slave labor that African populations were often subjected to, the Africans received better treatment and compensation in comparison to the new Indian indentured workers. Like the entire novel, the main point of view is through Rama’s eyes so the inequality between the Indian workers and the African workers could be because of his implicit bias against those of a different race and experience than him. He reflects, “Le samedi de quinzaine, seuls les nègres percevaient un salaire. Les Indiens, eux, dans leurs chasubles de soumission, prisonniers du paradis maléfique des colons, offraient leur corps au labeur, uniquement pour leur ventre! (On the Saturday of the fortnight, only the negroes received a salary. The Indians, in their chasubles of submission, prisoners of the evil paradise of the colonists, offered their bodies to work, only for their stomach!)” (117). The novel continues to chronicle Rama’s experiences over the next several years as he continues his life as an indentured servant in Guadeloupe. He does not gain increased respect from his bosses, which include both the French landowners and African managers, but he does gain the respect of his fellow Indians for his efforts to equalize the treatment of Indian and African workers by the French. This tumultuous relationship between races pre-dates the race riots that many Anglo-Caribbean and Franco-Caribbean countries faced
in the 20th century when England and France began to decolonize. The namesake of the novel, Aurore, returns to the plot during the final chapter of the novel when she is recognized by Rama when she first arrives in Guadeloupe. Although she did not expect to see him, they eventually rekindle their relationship that originated prior to Rama eloping with Sarah, and they marry. The end of the novel depicts his nuptials with Aurore and escaping the plantation, reinforcing the powerful influence social support can have to combat and defeat.

**Dehumanization and Intergroup Bias**

Slavery and contracted work are often viewed as forms of dehumanization because of the exploitation of people of a particular ethnicity or race to work for little to no pay in under-resourced and abusive environments. Scientifically, dehumanization is defined as “the reduced tendency to attribute mental states to outgroup members” (Harris and Fiske, 2009).

Dehumanization arises between groups when one group characterizes the other as lacking an intrinsic property that makes them human. This renders those in this dehumanized group as more similar to animals than humans in the perceiver’s eye and causes them to be mistreated and abused (Gelman, 2003). Animals, including humans, are characterized as having an elementary degree of emotion, like sadness, fear, and pleasure, emotions that are often easily expressed. However, what separates one’s perception of emotion of animals versus humans is that humans can feel more abstract and higher order emotions like remorse, admiration, and nostalgia than other animals (Leyens et. al, 2012). Due to their perceived diminished degree of emotions, the dehumanized group is often subject to increased abuse and ridicule with little remorse from the dehumanizing party. Instances of dehumanization in *Aurore* is the social ostracization of Sarah solely because of her caste, the deadly ship ride to the Caribbean that kills Sarah and her unborn
baby, and the harsh labor conditions in the sugarcane fields without apt compensation in Guadeloupe.

Based on social cognition studies (Benzio and Diesendruck, 2015, Van Noorden et al., 2014, Costello and Hudson, 2014, McGlothlin and Killen, 2015), outgroup bias and social essentialism are the causes of the subconscious dehumanization that occurs between in-groups and out-groups. These studies showed that racial bias and preference for one’s own race socially can be seen as early as pre-school in terms of friendships formed between children and how generous they innately are towards those that look similar or different to them. It was found that white students were more likely to make friends with those that were also white and when given items of varying quality they would more likely give items of better quality to those in their same race (Benzio and Diesendruck, 2015). In highly segregated countries, it was also found that wealth was associated with fairer skin tones, which led to preference for those of lighter complexion even in those with deeper complexions (Olson et al., 2012). The intergroup bias, between white populations and people of color, is reinforced by social essentialism, “the belief that members of social groups share inherent and unchangeable traits that remain true of group members even when their physical appearance changes (Gelman, 2003).” If it is hypothesized that there is an inherent quality that distinguish humans from animals, the socialized in-group inherently thinks that these socially inferior out-groups lack this characteristic, which makes them more open to dehumanization.

In Aurore, Rama recognizes the degree of dehumanization faced by the indentured workers because he transitions from a place of privilege as a part of the Brahmin caste in India to a place in the lowest class of the social hierarchy in the Caribbean. Due to this social shift, he experiences dehumanization from two perspectives as the dehumanizer and the dehumanizee. In
the beginning of the novel, he and his family are the socially superior and his relatives view the lower castes, including Sarah, as not worth associating with or speaking to. The key conflict that causes the rift between Rama and his family is their belief that there is a quality within the Brahmin caste that is inherently not present in Sarah’s caste. This deficiency parallels the unique human aspect that is discussed in neurological research. This is seen because Lila, Rama’s relative does not ever consider speaking to Sarah solely because of the caste that she was born into. Since Lila finds that those of Sarah’s caste are not worthy of acknowledging in any capacity, there is a degree of dehumanization since Lila is treating Sarah as if they are like two separate species. While Rama was never as righteous as Lila in how he interacted with different castes, he did witness this form of social discrimination and was complicit until he elopes with Sarah. On the other hand, Rama never realizes how these out-groups were truly treated until he was on the receiving end of the discrimination as an indentured servant. Unlike Sarah, he immediately realizes the difference in standard of living and the degree of disrespect experienced by the lower class. This carries on when he tries to bridge the difference in treatment between the African and Indian populations in Guadeloupe. He even is quick to rebel compared to the other laborers shouting at the white plantation owners, << Elle [Sarah] est morte parce que les Blancs nous ont trompés (‘She [Sarah] died because the whites cheated us’) (105),” when asked about his wife when he first arrived in Guadeloupe. Since he lived on both sides of the spectrum, the social atrocities experienced by the Indo-Guadeloupean indentured workers was highlighted, instead of being assumed as the norm like other characters in the novel.

One of the distinguishing factors of the Caribbean during the 19th century was the diversity of the population in comparison to the remainder of the world. While in the 21st century, almost every country has a population composed of many different races, at this point,
even America was only predominantly habituated by Europeans. In the Caribbean, because of colonialism and the labor markets, there were indigenous, Chinese, Indian, European, and African groups all living in the same territory. Rama reflects on this diversity when he first arrives to Guadeloupe because this the first time where he is encountering all of these different races. He is sensitive to the difference in treatment of the Indians in comparison to the newly liberated Africans, some of whom become labor managers for the Indian indentured laborers. Instead of collaborating with the African and Chinese populations to reform the society they lived in, intergroup bias, which is “the subconscious bias against someone in one’s perceived out-group, lead to bias in norm enforcement and collaboration (McAuliffe and Dunham, 2016)”. Since the African population received more power and respect than the Indians, Rama directed his aggression from the European colonizers to the Africans who he believed gained more rights than they deserved. He prioritized solely the rights of the Indian people due to his intergroup bias, which often leads people to criticize those they believe are different from them even if they experience the same subjugation. This was evident in Caribbean politics when the African population were able to claim citizenship shortly after the start of indenture, but Indo-Trinidadians did not become citizens until the 1920’s, after the indentured labor trade ended (The Economist, 2017). Since Rama did not come from a marginalized social class in India, it appears that he was keener and more vocal against the discrimination towards Indian people in Guadeloupean society. This leads to him being an advocate for the reform of the plantation labor system and the resurrection of Indian culture in the Caribbean, since most traces of their cultural practices were waning as their time away from India increased. This bias led to the animosity of these other ethnic groups, specifically the Africans, even though they were also the product of
European colonization and probably had similar sentiments towards the Indians, but it was not perceived because of the barriers created by intergroup bias.

Thus far, the namesake of the novel, Aurore, has not made an appearance since the first part of the novel, when Rama was arranged to marry her until he elopes with Sarah. After years of living alone and laboring, Rama reached a point in his self-reflection when he realized that he could not return to India because he no longer had any strong familial connections there. Instead, realizing the dominance he felt of European and African culture in Guadeloupe, he wanted to have a family so that he could continue the Indian traditions that he had been raised practicing that were absent from Guadeloupean culture. At this same time, when Rama feels extremely detached from the society he is living in, he notices a familiar face coming off the boat from India as a new ship of indentured servants arrive. He realizes that that face was in fact his ex-fiancé Aurore, the woman he abandoned at the beginning of the novel. He is instantly infatuated with her and ties her identity to his desire to propagate his Indian culture in this new land. Once they reconcile, Rama learns that after his escape, Aurore is un-marriable because she is now considered undesirable since her engagement was broken off. She had a relationship with white colonial officer and had his child before eventually fleeing India. Rama decides that it is fate that the two eventually found their way back to each other and decides to marry Aurore so that he can have this family unit he has recently aspired to have so that he can continue to the Indian traditions. Aurore, meaning dawn in French, serves as the catalyst for Rama’s new beginning in Guadeloupe as he separates himself from the oppressive plantation labor system.

Rama’s sentiments are not unique to his character. Many Indo-Caribbeans have felt that their Indian roots were being erased as they remained in the Caribbean for longer periods of time. Today, the majority of studies involving Caribbean populations are centered around the
Afro-Caribbean experience. Poets, like Khal Torabully, have centered their career on emphasizing the Indo-Caribbean experience through works that align with Ponamen’s theory of l’indianité and universalizing the Caribbean experience across races. One of his poems, Je prétends condamner le sang (‘I am to blame the blood’), discusses this loosened connection that Rama is experiencing as he realizes that he will never return to India. Torabully writes, “mon élément trace/efface/mon passage (‘my element traces/erases/my passage by sea’) (Torabully, 2002).” Torabully and Rama both feel that their experiences as ‘coolies’ in the Caribbean slowly and steadily erased their maternal culture.

This plot aligns with neuroscientific studies that show that social support can help ameliorate social defeat (Gaffrey et al., 2019). Before seeing Aurore again, Rama is losing his sense of purpose in life and does not necessarily have any goals aside from just surviving day to day in this society that is explicitly biased against him. In addition, Aurore has faced an extreme degree of adversity that has led her to flee her country, similar to Sarah who was a social pariah, despite being in the highest social caste and being college-educated. They both are acting out of desperation to find some semblance of purpose and security until they meet each other. The novel concludes with their reconciliation to demonstrate that even in a society that is based on discriminating based on one’s race, social support can help ameliorate the effects of this subjugation and lead to the confidence to take pride in one’s maternal culture. Instead of Rama embracing all the cultures in Guadeloupe, he seems to want to have a family that only values Indian traditions, which was the cultural system that originally drove him to flee his mother country potentially due to his experiences in Guadeloupe.

Recently, research has been conducted to understand the neuro-activation of those who are dehumanizing others (Bruneau et al., 2018). Bruneau and his colleagues strived to delineate
the different neural networks that work to dehumanize others rather than just disliking others. Dislike is correlated with simply not liking someone or something whereas dehumanization is viewing someone as lacking the essence of being human (Jardina and Piston, 2016). One could like someone and still dehumanize them, and one can dislike someone but still consider them human. In this study, participants were presented with images of target groups that were shown to trigger blatant and dislike in a fMRI scanner in order to track the functional activation of the brain when presented with each image (Bruneau et al., 2018). Participants ranked their perceptions of each presented image, and it was found that low-status groups, like homeless people, Muslims, and Gypsies, were dehumanized significantly more often than high-status images, like Americans, Europeans, and physicians. Based on their results, it was concluded that the left inferior parietal cortex (IPC) and left inferior frontal cortex (IFC) were the key areas that were associated with dehumanization ratings, which was consistent with studies in animal models (Figure 3). These findings distinguished dehumanization from dislike because the functional areas that correlated with rankings of likeability were the posterior cingulate cortex and the medial prefrontal cortex.

With these areas of the brain, the left IPC and left IFC, arising as potential centers of dehumanization it would be useful to understand what else interacts with these cortical structures. This relates to the previously discussed semantic atlas. There were five key regions of the cortex that were activated by both social and violent stimuli, which were the angular gyrus in the lateral parietal cortex (Brodmann’s Area 39), the superior and middle frontal gyrus (Brodmann’s Area 6 and 8), the middle temporal gyrus in the lateral temporal cortex (Brodmann’s Area 21 and 22), and the precuneus gyrus in the medial parietal cortex (parts of Brodmann’s Area 7, 21, and 31), and the inferior frontal gyrus (Brodmann’s Area 44 and 45).
Each of these regions had unique effect on social cognition in associated neuroscientific research on each of these cortical regions of the brain, but in this thesis, I will be focusing on the inferior frontal gyrus and the lateral parietal cortex.

In regard to dehumanization and the activation of the IPC and IFC, it was found that words with overlapping violent and social meanings activated the IPC and IFC (Figure 2a/2b). For instance, in the semantic atlas model in the IPC, some of the words that caused the highest degrees of activation are ‘servant’, ‘murder’, ‘guilty’, and ‘victim’, all signifying this relationship of treating someone else unfairly, even specifically mentioning roles in the indentured labor system. There were also numerous other terms that signify legality or justice, including ‘consent’, ‘custody’, and ‘judge’. So not only are the actions of murder and crime potentially stimulated by this region of the parietal cortex, but words signifying these actions also have a similar effect. Similarly, in the inferior frontal cortex, the same overlap in social and violent terminology causes activation, including activation caused by words, “murder, guilty, and confess”. These words demonstrate an overlap of social and violent meanings because they signify social meanings behind actions, for instance in the legal system, and also violent actions committed against two humans. The difference between the two sections is that in the inferior parietal cortex, there was also activation caused by words of familial importance, like ‘pregnant’, ‘marriage’, and ‘child’. These words also related to extremely violent terms, like murder, which signifies a potential case for how the brain processes relationships and dehumanizing crimes towards others. In addition, in the inferior frontal cortex, validity seemed to activate this region of the brain with words such as “correct, false, answer”, being key words for activation. This could overlap with the decision-making processes often associated with the executive function role in the brain in the orbitofrontal cortex, which judge the morality of decision making.
(Rosenbloom et al., 2012). This region of the brain is contested to be the area of the prefrontal cortex where the morality of decisions is considered before executing them, so decisions that are socially immoral, like murder, but are still committed by the person could cause activation in this region of the brain because of the moral contemplation taking place. The activations from the fMRI scan of visual dehumanized stimuli present parallels to neuro-activation caused by verbal stimuli of actions associated with dehumanization.

The left inferior frontal cortex (IFC) has been studied independently of the semantic atlas and has been found to be responsible for inhibition and segregation responses along with areas of the inferior prefrontal cortex and inferior frontal gyrus (Swick et al., 2008, Zhang et al., 2004). Inhibition of motor function has often been attributed to executive control in the inferior prefrontal cortex because of its role in mapping sensory outputs, thoughts, and actions (Michael and Cohen, 2001). However, in an fMRI study it was found that the integrity of the left inferior frontal gyrus was essential for the successful inhibition of motor controls (Swick et al., 2008). Similarly, segregation, the ability to select between multiple competing stimuli, is an ability often studied within the right dorsolateral prefrontal cortex and the frontal cortex (Rowe et al., 2000). The dorsolateral prefrontal cortex can direct one’s attention to segregate between salient and non-salient stimuli. There is a newly arising perspective, the selection hypothesis which includes the left inferior frontal gyrus in addition to the dorsolateral prefrontal cortex as part of the activation pattern in semantic retrieval tasks, which require participants to segregate between stimuli (Thompson-Schill, 2003). In a fMRI study when subjects were presented with multiple stimuli simultaneously with cues for which stimulus was the most relevant to commit to memory, it was shown that there was an increased activation in the left IFC when the salience cue was the strongest (Zhang et al., 2004). The roles of inhibition and segregation in the left IFC
could relate to its relation to dehumanization because in order to dehumanize another human it is necessary to (1) distinguish which category of people one wants to dehumanize and (2) inhibit one’s moral decision-making when choosing to harm them. However, in this research so far, the left IFC has primarily been associated with motor inhibition. It would be integral to see if this inhibition applies to moral decision-making.

The left inferior parietal cortex is most often studied in regard to language processing and working memory limitations, which was not explicitly applicable to the discussion of dehumanization (Jäncke et al., 2001, Ravizza et al., 2004, Rivera et al., 2005). However, there is another region that was highly activated by social and violent stimuli in the semantic atlas that neighbors the inferior parietal cortex, the temporo-parietal junction (TPJ) (Huth et al., 2016). The TPJ incorporates information from the sensory relay center of the brain, the thalamus, the limbic system, and the sensory systems of the brain. The TPJ has been found to be having overlapping functions involving attention, memory, language, and social processing. This makes the TPJ a region that incorporates both signals from inside the body and is linked to making decision making based on social context (Carter and Huettel, 2013). Thus, based on one’s social environment, including the physical location and people present, one’s social behavior can vary, which is perceived in the TPJ. Within the social cognition network, the TPJ was found to be sensitive to the behavioral relevance of one’s social environment, influencing decision making (Carter et al., 2012). This makes sense in the Indo-Caribbean context in terms of the overlap of social and violent terms because for Indo-Caribbean men had varying degrees of power based on their social contexts. As plantations owners, they had certain social power over their indentured laborers, so based on the social context of one’s role in the labor system, this allowed them to behave differently towards them. For those that were indentured laborers, this meant that this
subjected them to having a sub-par standard of living, facing separation from their families, and being restricted to predominantly work as menial laborers without accessibility to social mobility or higher education. By distinguishing treatment of others based on social environment, this allowed European colonizers the ability to treat the indentured laborers like they were not also human beings, or at least not human to the same degree as their European peers. In recent studies, human models that have experienced dehumanization have shown cognitive and emotional consequences by demonstrating aversive self-awareness and increased feelings of shame and guilt (Bastian and Halsam, 2011).

Another explanation for this overlap is that this region of the brain is activated by words symbolizing both positive and negative social relationships, without regard to valence. This region of the brain may not be specifically attuned to acknowledging that key terms like “child, mother, and husband” are generally considered positive, whereas words like “murder, guilty” are negative. Instead, these regions of the brain may just be activated by words that have any meaning referring to interaction between two people.

The chronicles of Rama, Sarah, and Aurore in two very segregated social structures demonstrate that dehumanization and social defeat were concepts that were pervasive within the Indian and Indo-Caribbean communities. Rama’s experience on both sides of the social hierarchy emphasizes the dramatic difference in treatment based on one’s socially determined class. At the beginning of the novel, he was largely ignorant to the monumental psychological effects of marginalizing an entire group of people when he is living with his family as a Brahmin. It is not until he elopes with Sarah, a social pariah, and decides to become an indentured servant does he understand the degree of mistreatment that socially discriminated people face. Through his voyage to Guadeloupe and while working, he constantly advocates for
the humanization of the Indian people, who have fallen to the bottom of the social totem pole. Through his social isolation, he experiences chronic social defeat and dehumanization by being used solely as a laborer while being given minimal benefits or social rights. It is only until he finds social support in the namesake of the novel, Aurore, that he begins to forge a path in the future by working to re-establish Indian customs in the next generation of Indo-Guadeloupeans.
Picking the Wrong Fight: Inter-racial Relations between Indo-Caribbean, Afro-Caribbean, and European populations

Race Perception in Fiction

By the middle of the 19th century, when Indian migrant laborers were arriving in the Caribbean, the region was one of the most diverse regions in the world. Today, the United States is considered to be one of the most racially and ethnically diverse countries in the world; however, in the middle of the 19th century the United States was still predominantly Western European. In the Caribbean, there were the European colonizers, recently emancipated African slaves, and Indian and East Asian migrant workers present in the Caribbean simultaneously living in the same regions of the country. This led to strife between ethnic groups, especially once these colonies became independent and these groups had to collaborate to form their own governments, specifically between the Indian and African populations that became the predominant demographics within the Caribbean. There is a stark difference between how the Indian populations viewed the European population and the African populations, the former they honored while the latter, they disparaged. These inter-racial relations were subtle components of the narratives studied and put into question the influence of intergroup bias and its effect on social cohesion and conflict between these groups.

Shani Mootoo explores sexuality and the influence of marriage and the male gaze through the Indo-Caribbean lens in her novel *Valmiki’s Daughter*. There is only one white character in the novel, Annick, Nayan’s husband and Viveka’s love interest. Annick was thought of as the quintessential, unattainable image of beauty in the novel. Throughout the novel, it is clear that the traditional gender norms for men and women dictate how attractive someone is. For women, that meant being a docile wife, talented cook, and dedicated mother. However, Annick
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was almost the antithesis of these qualities. She was frequently praised for being French and slender, but she did not cook Caribbean dishes and often fought with her husband in public, which was a violation of social cues at the time. Despite violating these gender norms, the other women in Trinidad could not compete with her allure. She quickly rose to the status of a socialite, garnering the attention of anyone at any dinner party she attended, even her husband who had high social capital as an heir to a cocoa fortune. In fact, “People build parties around Annick. They threw these parties after making sure she was available. Annick pushed and pulled Nayan in a world of high living and society that he and his family, in spite of their business connections and wealth, had not previously easily participated easily in (Mootoo 233-234)”. This social shift is not ignored by Nayan. Despite being a wealthy cocoa heir in Trinidad, when Nayan arrived in France to meet his then fiancé Annick, Nayan reflected that he was embarrassed to share his ancestry with his future in-laws, since they were white. He reflects, “He did not want to introduce himself as a descendant of indentured field workers, so he said simply that his ancestors had immigrated to Trinidad less than a century ago, from Northern India (Mootoo 214).” He continues to note that, “In the streets he had come face to face with what appeared to be an almost official reproach for his colour. He was not unaware of these slights but did not have the stomach to tell Annick (Mootoo 240)”. His thoughts demonstrate that he is not only embarrassed of his family’s ancestry, but also of being a person of color. He realizes no matter how much wealth or prestige he has, he will always be viewed differently because of his skin. Although he has benefited from being that top of his social hierarchy, when in France he realizes the lower position his race innately places him under the white population. This originates from his family’s experiences in Trinidad and India because the white colonists were the ones to
coerce their migration and created the social hierarchy in Trinidad that still existed when Nayan was growing up.

In addition, normally who one could marry was very strict. The only marriages that were socially approved were between two people of Indian origin, the same religious faith, and ideally in the same caste. This aligned once again with DeJean’s marriage plot because of the social and economic aspects intertwined with marriage. Annick represented none of these things, she was French, Christian, and inherently not a part of the caste system. However, Nayan was viewed as marrying someone superior to anyone in the entire Caribbean solely because of her race, which exempts her from any of the pre-established social rules. He even reflects that, “He had wanted her to become pregnant … had wanted her to publicly carry his child, a child who would be half her and half him (Mootoo 250).” Through this quote, it seems that he wants to show society that he is just as good as Annick and the white population she represents because Annick, the standard form of beauty, would be carrying “his baby”, who would by association be a part of her beauty. This demonstrates the power that resembling the former ruling class has on post-colonial Trinidad and how even if one diverges from one’s set norms, they can still be admired solely because of their appearance.

On the other hand, the other social groups in the Caribbean were placed as inferior out-groups to the Indo-Caribbean population. This was specifically true of the Afro-Caribbean population that makes up a substantial proportion of the Caribbean population because they were descendants of the Caribbean slaves. In Valmiki’s Daughter, Viveka passionately wants to join to local volleyball team. This causes a conflict with her mother because it does not align with the lady-like activities she felt like her daughter should be focusing on, but also the practices took place in the local park where local black men often spent time. Her mother felt like she should
not spend any time where black men frequented for her social status and safety. Mootoo even portrays the black men in the park sinisterly by aggressively flirting with Viveka when she eventually defies her mom by joining the team.

A similar relationship is seen in *Aurore* when Rama first arrives in Guadeloupe and notices the discrepancy in treatment between the African and Indian populations. Since the Africans were previously slaves and recently liberated because of the legislature passed in Europe, the emancipated slaves and their descendants had more social capital than the new Indian migrant works. Even though both these populations were being subjugated by the same population, there was animosity between the two groups rather than animosity towards their colonizers. Rama reflected that it was unfair that the Africans received a salary while the Indians received marginal compensation. It was as if both groups deemed the white population superior and just in their role of being in charge of doling out resources and that the only way to improve their living conditions is to conflict with the other migrant worker population. In *Coolie Woman*, Bahadur found anecdotal evidence for the social disaccord between the migrant populations finding that a local colony sheriff said, “It is the rarest thing in the world for an Indian to take up with a black woman. There is a mutual antipathy between the races” (88). This “antipathy” has carried on into the latter part of the 20th century where this antipathy contributed to race riots in many of the Caribbean colonies on the brink of their claim for independence.

It is important to note that the Indo-Caribbean and Afro-Caribbean experience have many fundamental differences. Although many Indians were coerced or manipulated into becoming indentured servants, many Africans had no choice in terms of being sold into slavery. In addition, indentured labors typically had a time limit to their service and were more humanized than the Africans who were considered property rather than humans. The African slaves were
prohibited from continuing to practice many of the cultural rituals, while the Europeans did not seem to restrict the Indian population in the same cultural ways (Murdoch, 2003). Despite the racial tension between the African and Indian population, the Creole culture often associated with the blending of the Indian and African cultures that manifested them in foods and music that were culturally similar, yet distinct from those found in Africa and India. This Creole culture is what continues to bridge the Afro-Caribbean and Indo-Caribbean communities together.

The social stratification created between the numerous races represented in the Caribbean is explained by in and out-group formation. People form in-groups and out-groups by grouping people based on identities that they believe others either have in common, or not, respectively. These identities could be an array of different social or physical characteristics. In zebrafish studies (Nunes et. al, 2020), it was found that the body shape and biological motion of other zebrafish determined how a zebrafish figured out the social class of others. For instance, in video playbacks of zebrafish populations, fish were more responsive to engaged with fish that had faster body movement than those that were static. The researchers behind this study believed that this was because faster moving fish had higher vitality, which signaled higher social salience. Social affiliation has been further studied in rodent models, specifically mice because they live in colony structures and prairie voles because are monogamous (Beery et al., 2018). This research demonstrated that these models appeared to be more comfortable with others in their species based on the length of their exposure to each other and if they had direct contact or not. Prairie voles appeared to have increased social and partner preference for other prairie voles when they were exposed to them for longer with direct contact, whereas the mice did not have significantly different behavior between short and long exposure. For some rodent models, this demonstrates the importance of familiarity and direct contact for social affiliation.
In the novels discussed thus far, the predominant characteristic that governed these in-group and out-group formations was race. Throughout the entire Caribbean community, the most evident way to distinguish people was by the race. Based on one’s race, one could presume their social role, as a plantation owner, freed slave, or migrant laborer. From the perspective of the Indian population, who were predominantly indentured laborers, they valued the white colonizers because they had social capital that could potentially help them in their own lives. On the other hand, while African populations were freed during the age of indenture, they had less social capital and received worse treatment from the white population than from the Indians, making them less socially salient. This made the Indo-Caribbean population more likely to discriminate against the Afro-Caribbean population and admire the European population because of their elevated social status and role. The influence a specific group had in their social environment influenced the social priority they were given.

Social Cohesion

The perception of others’ social class and rank has shown to influence social cohesion. Social cohesion is a measure of the connections and solidarity between different communities and societies, despite the formation of in-groups and out-groups (Shigemoto and Kawachi, 2020). In modern studies, social cohesion was studied in the Texan population affected by Hurricane Ike in Galveston in 2008. It was hypothesized that the natural disaster that affected everyone equally despite social class or rank would increase social cohesion since there was a communal sense of surviving tragedy. Through a longitudinal survey, it was found that 15 months after the natural disaster there was a positive correlation between social cohesion and the psychosocial quality of life, meaning that there was both improvements in social cohesion and the psychosocial quality of life throughout all test demographics of the populations. These
findings reinforced the importance for long-term relief programs and interventions in order to continue this positive association. This relationship could be related to the Indo-Caribbean experience because of the traumatic experience travelling from India to the Caribbean on ship. Due to the poor conditions on the ship, more than 12% of men and 18% of women died during the voyage (Anderson, 2009). Before the voyage to India, in Aurore, Moutoussamy depicts India as a country riddled with division because of the caste system. In fact, the caste system is the impetus for why Rama and Sarah eventually migrate to Guadeloupe in search of work. However, after Rama and Sarah’s tumultuous journey, there is no particular discussion of caste afterwards. It seems that despite the original caste difference between Rama and the many lower-caste members on the ship, once they arrive in Guadeloupe, they are a united group because of their past shared experience increasing their social cohesion. Rama makes it his mission to continue the common Indian cultural practices with the next generation so that the Indian community in Guadeloupe can stay true to their roots. Due to the differential treatment of Africans and Indians in Guadeloupe, Indians gained citizenship and voting rights in 1904, decades after those of African origin (Iyer, 2011). This difference in treatment united the Indian population as whole, unfortunately this unification also caused them to ostracize the African population.

There have also been additional studies that demonstrate how perception can lead to the dehumanization of othered social groups (Harris and Fiske, 2006, 2007, 2017). The stereotype content model (SCM) is a social cognition model that demonstrates how one’s perceived warmth and competence lead to a difference in how one behaves towards another. Warmth is defined as the perceived ability to have strong interpersonal relationships with others. This is the primary measure of the SCM because from an evolutionary perspective one’s ability to co-exist with others socially is most important for survival (Fiske et al., 2007). Competence is defined as those
who appear to be high in social status. Since these hierarchies normally exist in more developed societies, they are considered the secondary measure of the SCM. When one is perceived to have high warmth and competence, they are most likely to be a part of one’s in-group because the person is thought to have high interpersonal skills and social status. Whereas the lower the perceive warmth and competence, the more likely to be positioned into one’s out-group, and even dehumanized. Modern examples of these stereotypically perceived low competence and low warmth groups are homeless people and welfare recipients. In an fMRI study, it was shown that when participants were given pictures that depicted items that would demonstrate low warmth and competence, the medial prefrontal cortex (mPFC), insula, and amygdala all had increased activation (Harris and Fiske, 2006). These regions of the brain are strongly linked to emotion, specifically disgust, which shows that feelings of social segregation can lead to neurological signs of disgust. Further studies showed that these areas were activated more strongly based on the degree of outgroup perception (Harris and Fiske, 2007). As participants had increasingly lower perceived warmth and competence, the aforementioned regions of the brain have a proportionally increasing degree of activation signaling the connection between the SCM, social affiliation, and neural activity. This could be seen in the Indo-Caribbean novels studied because the characters that have the most seamless relationships are those from the same ethnicity, religion, and caste, for instance Viveka and Nayan in *Valmiki’s Daughter*. Once there are discrepancies in these social measures, like between Lila and Sarah in *Aurore*, there begins to be conflict because of the moderate out-group perception. This intergroup bias becomes more drastic once multiple factors become present and can even lead to violence, like is seen between the Indian and African populations in *Aurore*. The rationale for the poor race relations between racial groups in the Caribbean could stem from a lower perception of competence in the other
group, but more importantly a lower degree of warmth, or interpersonal relationship skills, leads to the other minority races to be perceived as outside the Indo-Caribbean population’s in-group. The difference in perceived competence seems to rationalize why the Indian population of the Caribbean seems to revere the Caucasian population, which contrasts their relationship with any other race.

Additional fMRI studies have demonstrated how humans are potentially able to commit atrocities against other humans as a result of the activation dehumanization causes in the brain. With the heightened activation of the mPFC, amygdala, and insula, the perceiver has a lower ability to understand the minds’ of the dehumanized target, which only further deceases the warmth the perceived can have for the target (Harris and Fiske, 2007). With this decreased ability to understand the perspective of others, this leads to decrease sympathy when committing atrocities against others, like coerced migration which we have seen across all of the novels studied.

Due to the perceived social class mentioned previously between groups, this could affect cooperation and interaction between groups (Côté et al., 2017, Gong and Sanfrey, 2017). Social class in this context is specifically defined as “a stable facet of social identity rooted in objective, socially valued resources (income, education) and subjective perceptions of rank (Kraus et al., 2012). Cooperation and interaction are both governed by social comparison, which is directly evaluating the social status of others in comparison to themselves (Sapolsky, 2005). This comparison was based on the similarities and differences assessed between oneself and others. The similarity effect (Byrne 1960; Nahemow and Lawton, 1975) conjectures that groups that have more of these “objective, socially valued resources” in common, like income, education, and religion, are more likely to categorize themselves in the same social class. However, the
greater the difference, the farther one associates themselves with another. From this self-assessment, there are two possible outcomes: downward social comparison, meaning the person is of higher social rank, and upward social comparison, meaning the person is of lower social rank. When participants in this study (Sapolsky, 2005) experienced downward social comparison, there was an increase in social cooperation and made more decisions for the public good, while there the results were the exact opposite for participants experiencing upward social comparison. These results were thought to occur because individuals seemed to have an aversion to situations where they experience disadvantageous inequality rather than experiencing the benefits of inequality.

Oxytocin and Vasopressin

There have been numerous neuroscience studies examining whether there are specific hormones influencing one’s in and out group formation. Oxytocin and vasopressin are two integral peptide hormones active in the endocrine system. Oxytocin is produced in the hypothalamus and is released by the posterior pituitary gland. Oxytocin, colloquially called the “love hormone”, is traditionally studied in terms of its role in the female reproductive system and social relationships but is active in both sexes (Magon and Kalra, 2011). Oxytocin is predominantly studied in terms of its role in stimulating the uterine muscles to contract and produce prostaglandins during childbirth and also promoting breastfeeding. It is also important for an array of social cognitive functions like trust, recognition, and romantic attachment. Vasopressin, or anti-diuretic hormone, is released by the posterior pituitary and is predominantly promotes water conservation in the collecting duct of the kidney to maintain the blood’s osmolarity (Meyers-Lindenberg et al. 2011).
In addition to these physiological effects of these hormones, recent studies have also shown that these two hormones have an effect on intergroup bias in rodent vole models (Baribeau and Anagnostou, 2015). Oxytocin has been shown to promote prosocial behaviors, emotion recognition, and increased responses to social stress, whereas vasopressin has also been shown to influence social communication and increased reactivity to social stress. Due to their influence over social behavior, these hormones were examined when studying how one interprets others as either in their in-group or out-group.

Oxytocin is important for modulating social behaviors, like empathy, trust, in-group preference, and memory of socially-relevant cues (Donaldson and Young, 2008, Ferguson et al., 2001, Macdonald and Macdonald, 2010). Perception, as discussed, is a key part of in-group formation, which is heavily influenced by detecting socially salient stimuli and interpreting them. It has been shown that oxytocin is released in increased amounts when participants were presented with socially salient stimuli, specifically promoting in-group favoritism rather than out-group antagonism (Redgrave and Reynolds, 2008, Turner et al., 1987). In-group favoritism, is often generalized as empathy, or “the ability to understand and share the emotional state of others (Batson, 1998), which is a key prosocial behavior. Oxytocin was also related to in-group favoritism, or empathy, in an ERP study when Chinese adult male participants were presented with different people expressing the facial expression of pain. There was a larger amplitude in their reaction in the pain-related neural network in the anterior insula (AI), anterior cingulate cortex (ACC), and supplementary motor area (SMA) (Singer et al., 2004), signaling a higher release of oxytocin, when the person in pain was in their racial in-group (Sheng et al., 2012). Additionally, intranasal administration of oxytocin has been shown to promote intergroup bias, by promoting increasing in-group favoritism, envy, and gloating (De Dreu et al., 2010, Shamay-
This correlates with oxytocin’s other roles as an emotion regulating hormone. In addition, when there are social stimuli that could be considered threatening or dangerous, oxytocin levels would increase and even induce anti-social sentiments, like aggression and envy to combat them. Vasopressin is often studied in relation to oxytocin and has been shown to promote similar prosocial behaviors, like oxytocin, and also influence the formation of memories caused by social salient stimuli (Benelli et al., 1995).

There is still not a definitive explanation for the role of oxytocin and vasopressin on the role of intergroup bias and prosocial behaviors in the human mode because the majority of studies on oxytocin and social cognition have be conducted on rodent vole models. It is thought that there are oxytocin receptors that act along the neural network that regulates social behavior, specifically in the periaqueductal grey, ventromedial hypothalamus, anterior hypothalamus, and the amygdala (Caldwell, 2017). However, this neural circuitry is predominantly based on a rodent model, so it is still being determined whether oxytocin has the same activity in primate, and specifically human models (Grebe et al., 2021). Ongoing research is using the results found in rodent models and applying them to primate models and recently there has been discrepancies between the behaviors in rodents and primates, causing increased speculation on oxytocin’s role in social behavior in humans. This study studied the role of oxytocin and vasopressin in seminal vole, specifically to see if there were any differences in oxytocin and vasopressin use between monogamous and non-monogamous species of voles (Grebe et al., 2021). It was hypothesized that there would be increased oxytocin in monogamous species because of oxytocin’s role in social affiliation and bonding, causing a “pair-bonding circuitry. However, there was no difference in oxytocin release between the two sets of species, which places doubt on previous
speculation on the importance of oxytocin and vasopressin for social bonding and affiliation in primate models.

Tangentially, oxytocin and vasopressin are both known as regulators of anxiety and depression because they are released within hypothalamic and limbic areas of the central nervous system (Neumann and Landgraf, 2012). Oxytocin has been shown to regulate anxiety and depression while vasopressin is shown to increase depression and anxiety within the body (Yoon and Kim, 2020). Oxytocin has an anti-stress effect by inhibiting the main activation of the hypothalamic-hypophysis-adrenal (HPA) axis, which inhibits the downstream release of corticotrophin releasing factor (CRF), one of the key elements in the perception of stress. Oxytocin also interacts with the amygdala to create its anxiolytic effect. Because of their inverse relationship, it has been thought that it is essential for proper mental well-being and emotional regulation to balance these two neuropeptides. As mentioned previously, intergroup interactions are also modulated by oxytocin and vasopressin. By being placed in an environment where their social interactions were so drastically different than their original homeland because of the subjugation and oppressive race relations, this potentially could cause an imbalance in oxytocin and vasopressin in the body signaling the increased tendency to have depression or anxiety. A study found that in social stress situations there is an increase in oxytocin to create this anxiolytic state and this increase in oxytocin becomes learned, like in fear conditioning (Naja and Aoun, 2017). In social defeat paradigms in mice models, it was found that the oxytocin system in the brain was dramatically changed by increasing association with fear circuitry in the amygdala, hippocampus, and raphe nucleus. This caused a decline in oxytocin release increasing social avoidance behaviors in these mice, however these behaviors were reversed once intranasal oxytocin was administered (Neumann and Slattery, 2016). This demonstrates the connection
between social environment, the fear network, and oxytocin release on emotion regulation. This correlates with previous studies mentioned that those that experience dehumanization or social defeat have increased prevalence to have anxiety and depression.

Intergroup interactions have been directly applied to race in the past because of how large of an influence race has on modern social interactions. These studies focus primarily on the interactions between white and black people, however most inter-racial social relationships are similar in nature (Kubota et al., 2012). fMRI studies examining the blood oxygenation level-dependent (BOLD) levels in the brain for activation when participants are exposed to stimuli related to inter-racial relations and social decision making found that the network that was most active included the amygdala, anterior cingulate cortex (ACC), dorsolateral prefrontal cortex (DLPFC), and fusiform face area (FFA).

The amygdala is a subcortical structure in the temporal lobe that is often associated with emotional learning and fear conditioning. Numerous fMRI studies demonstrate that when one is presented with someone in their racial out-group there is a heightened activation of the amygdala, signaling increase feelings of aggression and fear (Stanley et al., 2012, Hart et al., 2000, Richeson et al., 2003). This pattern is clearly seen in white populations because of socialized racial hierarchy white people are easily considered one’s in-group and black people are considered one’s out-group. On the other hand, for black populations, who is in one’s in-group is unclear. It was found that in a similar study, 40% of black participants demonstrate pro-white sentiments, meaning they consider white people in their in-group, 40% demonstrate pro-black sentiments, and 20% were neutral (Ames, 2002). This demonstrates that in marginalized populations, it is unclear whether one should prioritize their own group, the socially superior group, or both. The potential repercussions of this amygdala activation are increased tendency to
fear and be violent towards that perceived out-group. However, a study has mentioned that although these neuroscientific findings signify that one has a tendency to feel aggression or fear when exposed to someone in their racial out-group, it does not justify them acting on these emotions (Abiodun, 2019). Specifically, in the context of the violence and subjugation seen in the indentured labor system, these studies may explain why this was the reaction of the European colonizers but does not justify it.

The anterior cingulate cortex (ACC) is a region that engages with executive control and mediates decision-making when there is an internal conflict over what choice to make (Botvinick et al., 2001). Subjects participating in an fMRI scan also took an implicit attitudes test (IAT) before going in for their scan in order to have a reference for their implicit racial bias (Richeson, 2003). It was found that participants that had higher IAT scores, corresponding to higher racial implicit bias, had higher activity in the ACC when presented photos of people in their racial out-group. This demonstrates that a conflict between their intrinsic desire to be nonprejudiced and implicit racial bias onset by the presentation of these black faces. It is important to note that for the majority of these studies, all of the participants were white, college educated, and of high socio-economic status, demonstrating a problem of true representation in subject populations and not conclusively figuring out how racial bias influences the ACC of people of color (Abiodun, 2019).

The dorsolateral prefrontal cortex (DLPFC) is another portion of the executive function network located in the frontal cortex. In decision-making, the DLPFC regulates the emotional aspects of making a decision, often modulating responses based on amygdala and striatum activity (Hartley and Phelps, 2010). Due to the interaction between the ACC and amygdala with the DLPFC, this region often is shown to increased activation when participants are presented
human faces of those outside their racial in-group. Due to this interaction, the dLPFC’s activity is modulated by implicit bias as well. As aforementioned in the dehumanization section of this paper, the semantic atlas (Huth et al., 2016) mapped the activation of different cortical regions of participants’ brains when presented with verbal stimuli. Despite its previously discussed limitations, there are interesting parallels between the words that activated the dLPFC and the effect of the dLPFC on racial bias. The words that activated a portion of the right dLPFC had an overwhelming overlap in their social and violent meanings, similar to the portions of the brain attributed with dehumanizing others. The terms that caused the highest degrees of activation in this region were “murder, anger, arrest, kill”, tying to the dLPFC’s interaction with the amygdala and the amygdala’s ability to increase feelings of aggression and fear.

The fusiform face area (FFA), cortical region in the temporal lobe where it has been shown that facial recognition is centered (Kanwisher and Yovel, 2006). In fMRI studies examining the neuroactivation of subjects when presented with faces of one’s in and out groups (Golby et al., 2001), white objects and faces were encoded more often than black objects and faces, shown by higher FFA activity for the white group. This demonstrates that those in one’s racial in-group has increased salience, which triggers increased memory and activity of the FFA. In relation to the semantic atlas model, this region in the brain actually was not considered semantically active, meaning that it did not reach the threshold for activation, since it is a predominantly visual area (Huth et al., 2016).

Although these neuroscientific studies support the claim that implicit racial bias influences the way the brain acts towards different racial groups, this does not justify violent or discriminatory actions against other racial groups. A large influence over the formation of racial bias is the social racial hierarchy that pervades the world, and if these societal factors were
mitigated to associated effects of this bias could be potentially ameliorated (Dasgupta, 2009, Van Bavel et al., 2008). However, one of the best ways to mitigate this racial bias is to understand the mechanisms that are impacted based on this implicit racial bias, as seen in the amygdala, ACC, dlPFC, and FFA. These studies have been predominantly completed on white participant groups in western countries, so the exact influence of race in different racial groups and societies around the world is still largely unclear.

Due to the strict labor hierarchy in the colonial plantation system, minority groups, specifically those of Indian origin and African origin were at odds. However, the Indian population seemed to genuinely respect the European colonists, even after independence. The establishment of an internalized social hierarchy is predominantly controlled by perception of others and how they are treated by others. Since the African and Indian populations in the Caribbean both were subjugated by the European population but had vastly different cultures, they often approached each other with lower warmth and competence leading to outgroup formation and intergroup bias. Oxytocin and vasopressin are two of the hormones that are contested to cause prosocial behaviors towards one’s in-group and intergroup bias towards one’s outgroup. This bias cause high levels of stratification in Indo-Caribbean society and continues to persist as Caribbean nations try to continue to refine their governments following independence.
Sex, Gender, Race, and Marriage: ‘The Marriage Plot’ and its influence on intersectional identities in the Caribbean

The term “intersectionality” was coined by Kimberlé Crenshaw (Crenshaw, 1989) when discussing the intersection between race and gender in the judicial system. Her work primarily focuses on black women who were not sufficiently protected by the law because the law protected against discrimination by race and gender, separately, but not together. While black men and white women were protected from workplace discrimination and alike transgressions, black women did not have the same protection. If a party could present evidence of not prejudicing against black men and white women, the case previously had no grounds for trial since there was no evidence of discrimination on the basis of race or sex, independently. However, through Crenshaw’s work, she invented the term “intersectionality” to represent this lack of protection for people that occupy multiple minority groups. Since then, Crenshaw has contended that intersectionality is not a topic that is unique to black women, but to people that are in racial, sexual, and socioeconomic minority groups (Columbia, 2017). Intersectionality plays an integral role in the experiences of certain groups of Indo-Caribbeans. Although as a group Indo-Caribbeans were marginalized by the European colonists, social minority groups, like women, LGBTQ+ people, and mixed-race people, experienced an additional layer of prejudice within their own Indo-Caribbean community, which could lead to amplified effect on their social cognition.

Indo-Caribbean Women

Originally, the Indian indentured labor system appealed to men who could not find work in India and who were hoping to make money to bring back to their families. However, when workers began to realize how impractical it was to make the trip back to India, these men started
to permanently settle in the Caribbean. In order to promote order, British officials began to specifically recruit women to the Caribbean in order to create stable family structures. However, only widows and unmarried women were legally able to be recruited for indentured labor (Bahadur 37). The vast majority of Indian girls were married by 14, thus making the eligible population for indentured labor extremely small, aside from those in low castes and the socioeconomically disadvantaged (Bahadur, 2014). However, those in abusive marriages often evaded the law and also migrated across the “kala pani” to find independence in the Caribbean. This caused there to be multiple times more men than women in the first generations of Indo-Caribbean people, with reported rates as low as 14 women for every 100 men (Bahadur 80).

One of the most common trends discussed in Coolie Woman by Gaiutra Bahadur is the gender-based violence experienced by women (Bahadur, 2014, Mahabir and Pirbhai, 2015, Puri, 1997). It is reported that “Indian men killed their romantic partners at a rate 142 times greater in Guyana than in India’s Northwestern provinces and Oudh”, which was a pattern seen across all Indo-Caribbean colonies (Bahadur 109). Bahadur contends that men committed increased rates of violence against women in Indo-Caribbean colonies compared to families in India because “the semi-forced migration of Indian indentured laborers caused tectonic shifts in power. Men accustomed to authority based on their gender, caste, or family position were ousted. On plantations, they confronted a system that flaunted its total control over them” (Bahadur 129). While men once had autonomy over themselves in India, they were now constantly living under the subjugated of the landowners. However, they still had power over their female counterparts, so violence against them could have been used as an outlet to feel like they had the power and dominance that they no longer had in their professional lives. Rather than taking out their anger
and angst against their bosses or other men, they took it out on a group they knew could not socially defend itself.

Women were often subject to sexual assault and abuse by both Indo-Caribbean men and British officers (Bahadur 67). Many men were unmarried and without any potential sexual partners. This led to an immense amount of overlooked sexual assault. Even though many married women were abused, a married woman being with another man contrasted with the values of the community. Rather than the assailants being tried or punished, the women suspected of adultery were often faced with extreme levels of brutality from their husbands. The judicial system did punish the physically abusive men for these crimes through the death penalty, unless the abuse resulted in the death of the victim. Women were still socially liable for their abuse if they were alive to withstand the abuse (Bahadur, 2014). Today the Indo-Caribbean countries have a domestic murder rate that is four times higher than the US and 13 times higher than the United Kingdom and Canada, which shows that it a continuing issue (Bahadur, 2014).

In addition, when the British colonies began to develop, the British empire began to establish educational structures to prohibit women from becoming educated. Due to the agricultural focus of the work in the Indo-Caribbean colonies, most families had many children so that they could help in the fields. School was often seen as a deterrent to fiscal success because it decreased the amount of time children were available to help the family. Although the British promoted education for men, primary education was illegal for girls as of 1904, which was active for over 30 years (Bahadur 204). This deprivation prohibited women from serving any role in society aside from farm hands, wives, and mothers until the middle of the 20th century. While men were progressively gaining literary, intelligence, and power in society,
women were still in the same state of subjugation that their ancestors experienced when they got off the boat from India.

The main roles for women in Indo-Caribbean society were as wives and mothers. In fact, the British empire began implementing gender quotas for indentured servants so that there were enough women with whom men could procreate (Bahadur, 2016). This directly engages with the 19th century western European literary theme, the marriage plot (DeJean 128). The marriage plot discusses the plot of novels that are entirely focused on the arrangement of marriages for purposes of social and economic mobility. In the novels studied in this thesis, the predominant role of the female characters was their value as future or current wives and mothers. In Aurore by Ernst Moutoussamy, the namesake of the novel is a product of the marriage plot. Aurore is Rama’s, an upper-caste Brahmin, fiancé. Her key characteristics are her beauty, age, and her college education. However, her education is meant to represent her social class and privilege rather than professional utility. Once Rama elopes with Sarah, a lower-caste social pariah, Aurore is socially ruined by being abandoned after becoming betrothed. She is absent for the majority of the novel, but she is eventually reunited with Rama in Guadeloupe where she reveals that she also succumbed to indentured labor when he left because she had no social capital since she was left at the altar. Although she had so many attractive qualities, including the privilege of having a college education, she experienced emotional and sexual abuse only to have the resolution of her life be becoming a wife and mother.

These experiences in sexual abuse, domestic violence, and lack of social resources lead to an increase in the dehumanization and social defeat sentiments shared by the Indo-Caribbean community. The shared tenacity of the women to persist and survive is a sentiment that bonded many women together as early as on the ship from India to the Caribbean, coining the term
“jahaji behen” (ship sisters) (Mahabir and Pirbhai, 2015). The Indo-Caribbean female population also experienced lower rates of suicide, despite facing increased rates of physical, emotional, and sexual abuse, compared to the male populations. In fact, Indo-Caribbean colonies had suicide rates that were anywhere from two to 20 times higher than that of India during the same time period and places with higher rates also had fewer women (Bahadur 127-8). Women and those of lower caste were shown to have the lowest prevalence of suicide compared to men of higher caste potentially because these men suffered from the highest change in loss of social power. As seen in Aurore, Sarah, a social outcast in India, was much more adaptable to the living circumstances on the ship to the Caribbean compared to Rama, who immediately had regrets about leaving his home country.

One could argue for the benefits of the female Indo-Caribbean experience. Most women were fleeing poverty, abusive marriages, and misogynistic cultural practices when they migrated to the Caribbean (Roopnarine, 2016). In contrast to India, women were allowed to be wage earners and have their own living, even if their culture and customs required them to be subservient to either their father, husband, or eldest son. In addition, since there was a shortage of women, women were able to barter fortuitously for social mobility into higher castes when being arranged to be married (Bahadur 92). Thus, some argue that even though women continued to face harsh hardships within the colonial system, they were given additional freedoms that were not previously experienced. Nonetheless, when comparing the treatment of men and women in the Indian Indenture System, women faced higher degrees of abuse and subjugation, whereas men faced the biggest decrease in power and autonomy compared to what they potentially received in India, spawning the suicide crisis amongst upper-caste Indo-Caribbean men in the early 20th century (Bahadur 104).
Generations of women experienced these harsh, inescapable social conditions, producing sentiments of social defeat and dehumanization. Thus, many of the impacts seen in studies of dehumanized populations, could be amplified in the female subsection of the population. Intersectional studies originally focused on the African-American female population, and studies on this population have shown the potential increased effects of social abuse on women of color (Gaffrey, 2019). This study surveyed 371 inner-city black women for signs of psychosocial vulnerability and found that these black women reported higher rates of social vulnerability, but lower support rates than their white Hispanic and non-Hispanic female counterparts, increasing their risk of experiencing post-traumatic stress disorder (PTSD). This correlates with other studies that conclude that people that are in marginalized sub-sections of society like low-income, women, and people of color are increasingly likely to experience PTSD and major depressive disorder (MDD) because of their difficult life experiences and decline in social support due to societal prejudice and discrimination (Vogel and Marshall, 2001, Gillespie et al., 2009, McLaughlin et al., 2010, Ghafoori et al., 2012). Although Indo-Caribbean women were not included in these studies specifically, their experiences of gender-based subjugation and systematic oppression are similar to those participating in these studies. Thus, there is a high likelihood that for the same reasons, Indo-Caribbean face higher rates of PTSD and MDD because of their social experiences and lack of social support. Currently, there are no reports on the prevalence of PTSD or MDD in Indo-Caribbean countries, like Guyana.

Intimate partner violence (IPV) and sexual assault were key distinguishing experiences between women and men in Indo-Caribbean society. In addition to the cognitive effects of dehumanization and social defeat as an indentured labor displaced from her homeland, women also had to withstand emotional, physical, and sexual abuse with little outlet because of the
expectation for them to be devout wives. Similar to the studies of low-income women of color, higher reported incidences of IPV correlated with higher rates of PTSD and lower self-ratings of mental health, although their physical health seemed comparable to their counterparts not experiencing IPV (Kamimura et al., 2014). In addition, in a Rwandan case study, women experiencing IPV had self-reported rates of depression, suicide, and PTSD that were twice as high as their male counterparts (Umubyeyi et al., 2014). This effect was persistent whether the violence took the form of psychological or physical and whether or not the abuse was bidirectional or not. This was similar to another systematic review (Oram et al., 2017), which found that women that experienced IPV were three times more likely to experience a depressive disorder, four times more likely to experience anxiety, and seven times more likely to experience PTSD. However, it was found that the greatest somatic impact was found in sexual assault victims and the greatest impact was found in women experiencing bidirectional IPV (Satyanarayana et al., 2015). Despite these extensive effects of violence on one’s mental and physical health, given the limited opportunities women had to provide for or educate themselves in the Caribbean, many women had to decide between the abuse or social ostracization and destitution.

Through the same semantic atlas study previously mentioned (Huth et al., 2016), there is an interesting intersection of violent and feminine terms. For instance, in the right superior prefrontal cortex (BA 9/46) with high activation caused by “murderer, killed, angrily, mother, wife, and daughter”, specifically feminine and violent. These words relate to the primary roles of women as mothers and wives in Indo-Caribbean culture and also the violence they frequently experienced. These regions are considered part of the right dorsolateral prefrontal cortex (dLPFC), which is known to regulate self-control and be involved with the emotional regulation
of decision-making (Hartley and Phelps, 2010). The dIPFC is connected to the emotion centers in the brain, including the amygdala and the striatum, which allows it to incorporate to one’s working memory and emotions into one’s decisions. In this situation, this may demonstrate the emotional basis of the domestic abuse, given that both violent and familial words activate this area. This also correlates with the connection to the high disease prevalence of anxiety, PTSD, and depression because these areas directly affect the amygdala and emotion regions of the brain (Sah, 2017).

As women voyaged from India to the Caribbean, they moved from one sphere of subjugation to another. Although many women enlisted as indentured laborers to escape the restrictions of child marriage and the caste system in India, many experienced heightened rates of domestic and sexual abuse by their intimate partners and colonial leaders, due to the skewed gender ratio and subjugation of Indo-Caribbean men. Women were also limited in their access to education and social elevation for decades into indenturement, which just continued the cycle of violence to the next generations of women. Women were expected to be devout wives and mothers no matter the circumstances, which caused them to withstand both physical and mental consequences. These trends of violence against women continue in the 21st century because of this culture of not sufficiently punishing the perpetrators of these violent acts, however there is not ample research dedicated to the mental health of these survivors.

LGBTQ+ Indo-Caribbeans

As the world gradually begins to accept different segments of the LGBTQ+ population, the Caribbean remains one of the starkest opponents to gay and transgender rights in the 21st century. In 2021, Guyana still has laws that potentially charge men with life in prison if caught committing sodomy, although it is loosely enforced. Trinidad also has laws in place that could
prohibit homosexual people from entering their borders (*The Economist*, 2016). Verbal and physical assault and discrimination against LGBTQ+ people are largely unpunished throughout the region. These laws are relics of those instated by the British crown in the 19th century and many LGBTQ-identifying Caribbean people have migrated in order to live without persecution (Human Rights Watch, 2019). The formation of these laws coincided with the timeframe in western society when sexuality became increasingly less fluid and heterosexuality and homosexuality were pitted against each other as the moral good and evil, respectively (Sedgwick, 1990). However, in a world that is gradually more accepting, many nations have used religion or the desire to prevent the spread of HIV/AIDS in their country as justification for their homophobic legislature and rhetoric.

Despite the array of sexualities and gender identities encapsulated by the LGBTQ+ community, the primary focus of research on the intersections between the queer and Indo-Caribbean communities predominantly focus on same-sex relationships. Gay and lesbian relationships were portrayed dramatically different in *Valmiki’s Daughter* by Shani Mootoo, a novel centered around a father and a daughter both secretly coping with their sexualities and what their place is in society. Valmiki is a middle-aged physician who is married to Devika and has two daughters, living the life that was expected of him despite his sexuality. He details his same-sex love affairs with men before his marriage. Valmiki discusses his exploration of his sexuality during his youth, emphasizing his relationship with a man named Tony, whom he meets when studying in England. At one point in his relationship, Tony pleads Valmiki to come out to his parents when he is visiting his family in Trinidad. However, when Valmiki returns to Trinidad he is arranged to marry Devika, which requires him to confront his sexuality. He reflects, “he did what he had done with no one else but Tony. He had sex with her [Devika],
cementing his determination to marry her. He hadn’t expected the first time he had sex with a woman would be sufficient for pregnancy to ensue. All of a sudden, he was to be a married man, with the usual ordinary expectations imposed on him” (Mootoo 69). After learning of Devika’s pregnancy, he ended his relationship with Tony and claimed his role a man in Indo-Caribbean society. His sense of duty to his family overpowered his romantic impulses.

Although Valmiki eventually gives into the societal pressures to marry a woman, he continues to have homosexual adulterous affairs in the present tense of the novel with a local married man, Saul. Despite the social deviance of his affairs, it seems that his wife and his lover’s wife are both consciously aware of these relationships, yet overlook it because of their role as men and the benefit their professional jobs give to them and their homes. Both wives have a conversation at one point in the novel. Saul’s wife says, “You and me, in this ting together…The consolation is that the good Lord gives us no more than what we are capable of handling. Take a look at me Mrs. Krishnu. I am managing. I know women living on my street who don’t come out they house for days because they don’t want nobody to see they black eye or lip bust. Me? I don’t have mark on my body” (Mootoo 124-25). Saul’s wife compares this adultery as the lesser of the abuses women had to face in marriage. Rather than expecting to resolve her husband’s adultery, she was just happy that she did not have worse problems, like many of her peers. For Saul’s wife, if this is her biggest barrier to being a devoted wife and mother, she can overcome it. Devika was shocked by this conversation because Saul and his wife were black and of a lower social class and was uncomfortable with sharing this intimate problem with someone of a different race and social class. However, she reflects on the situation and concludes that she too prioritizes appearing as a dutiful wife and mother over anything else. She reflects, “women like Devika [herself] had to behave themselves, take it all and smile in public
and defend their husbands even if they were tyrants or bastards or useless in the privacy of their own homes... Leaving one’s husband was done when the children were small, and she wouldn’t have been able to take them with her. She had done the right thing (Mootoo 123).” Similar to Valmiki’s decision to leave Tony, Saul’s wife and Devika both choose their societal duty to their families over their own happiness.

On the other hand, Viveka, an adolescent girl and Valmiki’s daughter, is just beginning to understand her sexuality and how it may influence her life. Compared to her father and his discreet lover, Viveka has a childhood friend, Merle, who revealed her love for her female teacher. Immediately, she was kicked out of her home and became a homeless girl in the town that no one wanted to associate with in fear of being thought of supporting her homosexuality or being homosexual themselves. Merle depicts what can happen when one does not express their sexuality discreetly. Viveka does explore with her sexuality, yet very few are aware of it. Even when Viveka demonstrates non-feminine like qualities, like being interested in sports or not being extensively social at one of her mother’s many dinner parties, she is scrutinized for being unattractive for potential suitors. The marriage plot is relevant in this circumstance because Viveka often conflicts with her mom for having attributes that are not of an ideal wife. Similar to in her own life, Devika is more worried about her daughter’s duties as a future wife and mother, rather than her own happiness. In fact, the only characters that are at all aware of Viveka’s sexuality is her future husband, Trevor, who finds it sexually interesting that she has been intimate with another woman, specifically Annick, Nayan’s wife, the idealized French woman. Both Nayan, Viveka’s family friend, and Trevor seem to fetishize their lovers’ sexual encounters with each other with the hopes of showing them the joys of ‘real sex’ (Mootoo 250). Instead of validating their sentiments as anything substantial, they reduce it to appeal to them sexually so
that they still have value as wives. The marriage plot can be applied to LGBTQ+ population in this respect. The value of men was their professional pursuits and their ability to make children and provide for them with his wife. Their sexual activity was not tied to their worth as husbands as long as they were fertile. Whereas for women, their roles were directly linked to being devout wives and mothers. Sexually deviant behavior was considered to be immoral and unbecoming of a mother and wives should be deferent to their husbands only, so if they had other desires, they would not make proper wives. Viveka’s most impactful romantic relationship was with Annick, a married woman. However, like Valmiki and Tony, they both eventually realize that their relationship had no future because neither of them had the means to support both of them or the desire to risk social segregation, like Merle. Throughout the novel, Mootoo depicts homosexuals has having to choose between choosing social acceptance and suppressing their sexuality or expressing their sexuality and risking social isolation.

Either of these outcomes, suppressing one’s sexuality or social isolation, both have long-term impacts on the person’s brain. Only within the last decade has public opinion in western countries dramatically shifted in terms of acceptance of LGBTQ+ populations. Prior to this acceptance, most LBGTQ+ people faced a similar dilemma that the characters in Valmiki’s Daughter faced. The social isolation that Merle faces could be studied in terms of the effects of social isolation caused by COVID-19 has on the adolescent population (Orben et al., 2020, Loades et al., 2020). It was found that adolescents are disproportionately affected with the lack of peer interaction because of the necessity of peer acceptance and influence for their development. Without this important element of social interaction during the pandemic, it has been found that children and adolescents are more likely to experience depression and anxiety during periods of social isolation. Without these integral developmental social connections, like
healthy peer relationships, it has been found that adolescents have an increased risk for depressive symptoms, suicide attempts, and low self-esteem (Hall-Lande, 2007). Another study found that there was an association between an adolescent’s preference for solitude and the odds of having suicidal ideation and self-harm (Endo et al., 2017). For those, like Merle, who are isolated due to their marginalized social position, they represent Indo-Caribbean people who are persecuted for not hiding their sexuality and these studies show that these isolated people may have an increased tendency for anxiety, depression, and suicide, especially for adolescents.

In a recent study examining closeted and out LGBTQ+ people (Bos et al., 2009), it was found that non-heterosexual people utilize numerous coping mechanisms in order to conceal their sexuality in societies where they would be persecuted for it. Some of these mechanisms are disassociating their sexuality from their social lives and masking the gendered pronouns of their significant other in public. Additionally, many closeted men are also known to be the most profuse homophobes as a way of combating any speculation of their own homosexuality by others in their community. In Valmiki’s Daughter, most of these tactics can be seen through the characterization of Valmiki who “made a point of engaging in disparaging jokes about women and faggots (Mootoo 55).”. In addition to these social mechanisms of coping with one’s sexuality when closeted, it has been found that concealment of sexual orientation was associated with symptoms of social phobias and anxiety disorders (Cohen et al., 2016). Sexual minorities, closeted or not, had a higher tendency to experience an array of neuropsychiatric disorders, like panic disorders, PTSD, and depression. This demonstrates when one conceals their sexuality in order to fulfill their social obligation to be married and have children, which correlates with the marriage plot, it can negatively affect their mental health.
LGBTQ+ rights are still contentious in the Caribbean today, with many independent countries still upholding the anti-LGBTQ+ laws that were constructed during the time of indenturement by the English and French empires. However, these laws do not cause these areas to have less LGBTQ+ people or lower incidences of HIV/AIDS (Papee, 2011). Many migrate to other parts of the world, like western Europe, the United States, or Canada to escape potential persecution for their sexuality, nonetheless not everyone has the luxury of fleeing their homes and families in order to be accepted (Logie et al., 2016). This results in many people having to decide between concealing their sexualities or coming out and risking social isolation and persecution. As several clinical studies have shown, either option has a number of neuropathological impacts, including increased risk of anxiety and social phobias for those closeted or suicide and substance of abuse for those socially ostracized.

*Mixed Race Indo-Caribbeans*

According to the marriage plot in the Caribbean, one was socially supposed to marry only those in the same race as them, and ideally in the same caste. From the beginning of indenturement, the Indian and African workers were often segregated and even occupied separate villages through the Caribbean (Bahadur, 88-89). Bahadur writes, “Contemporary observers blamed caste and race prejudices, concluding that Indian men viewed black women as Untouchables. But equally prohibitive were the attitudes of blacks, who resented Indians as unfair competition in the labor market (89).” Thus, for mixed-race children, specifically those of mixed African and Indian ancestry, they were inherently plagued from birth because they were the result of a socially illicit relationship. Afro-Indian people were ostracized more than Anglo-Indo children because although both came from illicit relationships, one came from a race that was considered inferior whereas the latter had ancestry that was considered superior. In
countries, like Guyana and Trinidad, where Afro-Indian Caribbeans were an often-enough occurrence, derogatory terms, like *dougla*, began to arise to describe those of mixed-race ancestry (Mehta, 2010). Throughout the novels studied, there were no instances of principle characters being of mixed ancestry. In a society where there is a binary of Indian and African people, those that embody both of these identities break this binary and create social distress.

Due to this contentious social position, it is possible that the mixed-race population faced similar sentiments of social isolation compared to the LGBTQ+ population because often in these illegitimate relationships, family members aside from the parents did not recognize the child, resulting in them only gaining social support from their parents and if possible, any other mixed-race people in the area. This correlates with a study concluding that those of mixed race are more likely to suffer from mental illness with lower levels of social support compared to their monoracial counterparts (Garcia et al., 2019). In accordance with the marriage plot, they face ostracization from their purely Indian and African counterparts because of their socially perceived muddled lineage, making it difficult for them to find their place within the marriage plot in Indo-Caribbean society, often making them one of the least desirable subsections of the population. Thus, they could experience similar symptoms of increased tendency to experience neuropsychiatric disorders, like depression, anxiety, and social phobias (Endo et al., 2017, Orben et al., 2020, Loades et al., 2020, Hall-Lande, 2017).

All of these experiences surrounding intersectionality are centered on the prioritization of the marriage plot in Indo-Caribbean society. The marriage plot is at the core of why social discrimination is not ameliorated overtime since people are socially programmed to favor those that match the same social demographics as themselves. The marriage plot often prioritizes the groom, causing women to be placed in a position of subjugation to and dependence on their
husband, resulting in increased instances of abuse. In addition, LGBTQ+ relationships are directly opposing to the gender binary presented in the marriage plot, which causes discrimination against those threatening this critical social structure. Mixed-race people also do not fit into this structure because of their mixed ancestry and are conceived from relationships that violate the marriage plot, thus making them inherently illicit from birth. With the use of the marriage plot from generation to generation, these biases are continuously propagated to each new generation by grooming them to only idealize those that have similar origins as themselves.
Culture and the Brain: Cultural neuroscience as an emerging field and future directions for Indo-Caribbean studies

“Culture is a complex process often conveniently treated as a variable, operationalized into the race, ethnic group, identity measures, or some measure of health belief at the individual level” (Bhui, 2018). One of the most prolific aspects of research on the Indo-Caribbean community is that this population’s culture is intrinsically distinct because it blends the Indian culture of their ancestors and the Creole culture developed in the Caribbean that developed during the time of colonization. Cultural neuroscience is the interdisciplinary study of the culture, mind, and the brain, which investigates how brain pathways are shaped by culture (Kitayama and Park, 2010). Thus, the emergence of this new Indo-Caribbean culture that occurred as a result of migratory labor may distinguish the neural activity of Indo-Caribbeans from their Indian counterparts.

Cultural neuroscience has becoming a budding new field within the study of neuroscience over the past two decades. Cultural neuroscience originated from cultural psychiatry, a practice that uses particular psychiatric interventions based on one’s ethnic and linguistic identities (Bhui, 2018). However, cultural neuroscience adapts itself to focus primarily on locations in the brain that may be useful for psychiatric intervention. This is distinct from social neuroscience because social neuroscience does not typically take into consideration ancestry (Cacioppo et al., 2010). Cultural neuroscience seeks to answers two questions: “(1) how do cultural traits shape neurobiology and behavior and (2) how do neurobiological mechanisms facilitate the emergence and transmission of cultural traits? (Chiao et al., 2010). Rather than examining populations by race or ethnicity, they study populations based on groups of people that have shared cultural practices and experiences. For instance, although Indo-Caribbean for the most part have the same ancestry as Indian people, their distinctive cultures could cause for differences in their brain
activity (Chui, 2018). In addition, compared to psychological processes, neuroscientific experimental methods, like fMRI and EEG, measure neural processes much more rapidly and on a smaller time scale (Kitayama and Park, 2010). A key example of cultural neuroscience’s relevance is the influence of neuro-activation in Asian populations that learned arithmetic using the abacus compared to Europeans and American populations that did not. While linguistic processing areas were highly active in European and American populations when making mental computations, there was much higher activation in the pre-motor cortex in Chinese and Japanese populations. Examining these cultural practices beyond tasks, like mental calculations, have even been shown to include one’s perception of self based on whether one is from an individualist or collectivist culture (Han and Northoff, 2009). However, there are numerous challenges to conducting authentic cultural neuroscience, including creating studies focusing on accurate cultural phenomena rather than stereotypes and accounting for the dynamic nature of culture over time (Chiao et al., 2010). Through meticulous experimental design, the goal of cultural neuroscience is to understand the neural correlates or functional genetic polymorphisms that demonstrate the influence one’s culture and one’s neural processes have on one another.

Although cultural neuroscience studies have been predominantly used to understand the neurological differences in those from the West and those from the East, it can also be applied to studying the differences between Indo-Caribbeans and Indians. Culturally, as seen in *Aurore*, the caste system has been a key feature of the Indian social structure. Once indentured workers landed in the Caribbean, all signs of caste were deemed irrelevant by the British colonizers. Even though those of the Brahmin caste tried to preserve their social status, everyone was treated the same under the law. In addition, while India was a British colony until 1947, there were still Indian people who had authority as colonial officials under the British crown, whereas in the
Caribbean, all Indian people were viewed as predominantly laborers. This difference in subjugation would be a pertinent topic in the difference between the Indian and Indo-Caribbean population. In addition, Indo-Caribbean people had to cope with the sentiment of displacement from their motherland.

In the Caribbean, the Indian indentured laborers were preceded by African slaves. Although there was inter-racial tension, the African population had a direct influence on the formation of Indo-Caribbean culture. These cultural exchanges led to the creolization of the Indian culture leading to Indo-Caribbean creole culture that is celebrated today through food, music, celebrations, and more. For instance, while Bollywood movies were shown in the Caribbean in the latter part of the 20th century, chutney and soca music, which has African influences through its use of the drums, is the music predominantly made by Indo-Caribbean people today (Sivathasan, 2019). This also parallels the predominance of English rather than Hindi in Indo-Caribbean populations. By the time of independence in the 1960s, the vast majority of Indo-Caribbean populations only used and understood English (Manuel, 1997). In addition, while Indo-Caribbean people continued to make the same food they made in India, the Caribbean had different varieties of produce that was readily available. Thus, many dishes, like curries and pastries became influenced by the Afro-Caribbean tradition, like blackeye, a pastry made with black eyed beans. There are also other pastries, like butterflap, tennis roll, and red bread, that are only found in the Caribbean. Additionally, the Indo-Caribbean population continues to celebrate many of the same Hindu holidays as their ancestors, like Diwali, but also made their own adaptations, like Phagwa to celebrate Holi, the festival of colors, and Caribana, an annual celebration of Fat Tuesday. Thus, although the Indo-Caribbean population share many
similarities with their Indian counterparts, as the two groups spent more time apart their cultures became increasingly distinct from each other.

Further studies investigating the Indo-Caribbean diaspora could investigate how the neural processing of this subsection of the Caribbean population is altered compared to their Indian counterparts due to their experiences with displacement, coerced labor, and Caribbean influences. Direct population studies that understand exactly how dehumanization and social defeat influence today’s generations of Indo-Caribbeans is integral to optimize treatment of Indo-Caribbean patients. I propose future researchers of this topic to work with patients both in the US or Canada and in the Caribbean (Zong and Batalova, 2019). Some areas that would be privy to have populous Indo-Caribbean communities are Queens, New York, where the Indo-Caribbean community makes up the second largest foreign-born population in the borough (ICA, 2014), and Toronto, Ontario, known as holding one of the largest Caribana, Caribbean culture festivals, parades outside of the West Indies. In the Caribbean, Trinidad and Tobago and Guyana, are the two countries that have the greatest proportion of Indo-Caribbeans in their population, comprising 37.6% and 39.8% of each country respectively. So, their capital cities of Port of Spain, Trinidad, and Georgetown, Guyana would be key locations in the Caribbean to work directly with Indo-Caribbean populations.

Since indentured labor is no longer active today in the Caribbean, the direct effects of dehumanization and social defeat from indentured labor would no longer be easily studied in the population. However, through the study of race and its effect on the health of patients in the US (Hudson et al., 2016), it has been shown that although formal racial discrimination in the US is illegal there are still discrepancies in care based on a patient’s race and a physician’s implicit bias against certain minority racial groups. One of the most prominent markers of racial bias and
Intergenerational trauma is seen across socioeconomic status in the degree of preterm labor in a population (Manuck, 2017). A potential direction to understand the general health of the Indo-Caribbean population is to survey the rate of preterm labor and the reproductive health resources available in the community to understand how this population’s preterm rate compare to that of the entire Caribbean population and population of countries with similar economic and medical resources. According to recent reports, Guyana and Suriname, two predominantly Indo-Caribbean nations, have one of the highest percentages of low birth weight, another marker of intergenerational trauma at 23 percent compared to the average 10 percent for the Latin America and Caribbean region (UNICEF, 2019). Further studies on the cause of this drastic increase in these nations will reveal any inequities in care that are specifically affecting the Indo-Caribbean community.

Previous research presented demonstrated that those who experience dehumanization and social defeat and more likely to experience neuropsychiatric illnesses, like substance abuse. These illnesses are known to be highly hereditary via genetic factors that predispose certain populations to have a higher tendency to experience certain neuropsychiatric illnesses, like substance abuse and anxiety (Bevilacqua and Goldman, 2009) and since the time of indenturement was only around three generations, these illnesses have the potential of having a higher prevalence in today’s generation. Seeing the difference in substance abuse treatment in the Caribbean versus in North America would be relevant because in the Caribbean there still exists a degree of machismo that accepts men abusing alcohol and tobacco without seeking any treatment. In fact, bars and rum shops are predominantly male spaces where women are not permitted (Bahadur, 2014). These addicts only seek medical treatment if illnesses that occur as a result of their substance abuse, like lung cancer or liver failure, arise. However, in the United
States and Canada, this machismo does not exist to as high of a degree and many seek treatment for substance abuse before these other illnesses can arise. This pattern of behavior has not been documented in scientific literature, specifically in the Indo-Caribbean population, but is a trend that have I have noticed anecdotally in my own family. Thus, tracking this pattern of behavior and gender bias in the Caribbean could influence an increase of substance abuse awareness in male populations in Caribbean countries. We could account for this cultural difference by directly interviewing substance abuse patients in both countries to understand what they believe the onset of their abuse, the causes for this onset, and why they decided to seek treatment. By comparing the Indo-Caribbean substance abuse patients in the Caribbean and the United States, we can firmly understand the prevalence of this disorder and the potential impact immigrating to North America. Other variables like accessibility to primary care physicians and preventative health education can be applicable to understand how immigration influences the prevalence of substance abuse in the Indo-Caribbean population. This literature would be essential for treating substance abuse and promoting substance abuse prevention in the future in American Indo-Caribbean communities and abroad.

From a neuroscientific perspective, an fMRI study that extends the understanding created by the semantic atlas. Using a similar methodology and analysis from the original semantic atlas project, the influence of culturally relevant semantic stimuli on the brain activity in the Indo-Caribbean population. The semantic atlas is a pioneering model to represent neural activation in response to specific semantic stimuli. This project extends the methodology of this model by understanding how dialects and culturally specific slang terms influence the activation of the brain of someone within and outside of that culture. Within this study, we would present participants with dialogues from Indo-Caribbean people and the NPR *Moth Radio Lab* like the
initial semantic atlas study, to compare the activation of the Indo-Caribbean dialogue to an American dialogue. This application of the semantic atlas could also be in useful in other minority communities to see how culture influences how one perceives language.

Compared to North America and Western Europe, misogyny and homophobia are much more widely accepted in the Caribbean, which leads to higher rates of discrimination and hate crimes based on one’s social demographics. Gender-based violence and domestic abuse are exponentially higher in the Caribbean and the Caribbean still has laws that punish sodomy and homosexuality with life in prison (Bahadur, 2014). Both of the dialogues will feature people of various genders and sexualities in order to see if those in Indo-Caribbean populations have different activations to these people compared to the control population due to the differing degrees of stigmatization. For instance, the terms regarding homosexuality could be closer linked with words of violent connotation rather than social connotation in Indo-Caribbean populations compared to the control population. The areas of the brain activated by violent semantic stimuli coincide with some of the regions of the brain that generate intergroup bias, which ties prejudice and violence in society. These regions specifically would be in the superior prefrontal cortex and the dorsolateral prefrontal cortex. This aspect of the study could demonstrate how societal prejudice manifests itself in one’s neural organization and perpetuates violence against marginalized social groups.

For this study, we will recruit 45 right-handed adult participants, ages 18-39, from three demographic groups: Indo-Caribbean immigrants, Indo-Caribbean Americans (those of Indo-Caribbean ancestry but were born in the United States), and Caucasian Americans. The feasibility of this participant population would be increased in the New York metropolitan area because of the high-density of Indo-Caribbeans in this area, specifically in Queens. Each
participant can only have lived in America, aside from the Indo-Caribbean immigrant population, in order to control for cultural norms. Prior to fMRI scanning, each participant will complete the Implicit Attitudes Test (IAT), in the race, sexuality, and transgender categories, to understand their innate bias against a certain social group, if any. Each participant will also be screened for neuropsychiatric disorders, including major depressive disorder and generalized anxiety disorder, using the patient history questionnaire (PHQ9). In addition, there would be a cultural immersion survey administered that quantifies the degree of cultural engagement each participant has with the Indo-Caribbean population to understand how familiar each participant is with Indo-Caribbean culture. Questions on this survey will gauge participant knowledge about Indo-Caribbean food music, celebrations, and creole terms, in addition to explicit experience with Indo-Caribbean people. After the screening process, each participant will listen to two hours of narrative stories while whole-brain blood-oxygen-level-dependent (BOLD) responses were recorded by fMRI. The two-hour time length is identical to the original semantic atlas study; however, participants will only listen to NPR *Moth Radio Lab* while the other hour will be pre-recorded dialogues spoken between two native Indo-Caribbean people. The pre-recorded dialogues will be recorded will have speakers that match the gender ratio of the speakers in the NPR segments and will cover similar topics so that there will be key words in common that can be used to track activation. Stories will be screened so that from the Moth Radio Lab and the pre-recorded Indo-Caribbean dialogues there is are characters or points of view from multiple genders and sexualities represented. The fMRI scan will take place during the entirety of the radio narratives and afterwards the participants will fill out an exit survey that details their opinions of the stories presented to see if there are any clearly visible bias.
To analyze this data, the same methodology of the original semantic atlas study would be used. First key terms that were prevalent in the stories would be identified, specifically those that have social and violent definitions or connotations. The same terms in the social and violent categories in the original semantic atlas model will be used and there will also be additional categories for terms that signify sexual diversity. Terms that would fall into this category would be terms like gay, transgender, lesbian, same-sex couple, queer, and LBGTQ+. Many feminine terms like mother, wife, and daughter, were already included in the social grouping of words, so there will not be a section for gender diversity. These key terms would be identified for both the control NPR narratives and the experimental Indo-Caribbean narratives. In addition, words that signify gender or sexual diversity will be noted. The original semantic atlas was modeled using voxels, discrete elements representing a specific point in space in the cortical region of the brain. Similarly, each group’s fMRI scans will be grouped together to create a voxel model for which words specifically activated specific regions of the brain in the population. Linear regression is used to understand how specific words influence the BOLD responses of each participant. This regression allows us to understand which words actually caused a statistically significant increase in activation compared to the brain’s normal activation level to standard auditory stimuli. Each group will be analyzed for its responses to the NPR and the pre-recorded Indo-Caribbean stories independently, creating two models per participant group, leading to a total of six voxel models of the brain. These models will demonstrate the differences in activation between the dialect of the narratives presented. With these voxel models, we can compare the activations between specific regions in the brain so see which areas are activated in order to see how dialect influences brain activation spatially. This can also be seen with terms regarding
sexual and gender diversity terms specifically since the activation will be centered around words with specific categories.

Dr. Huth, the original creator of the semantic atlas brain model, created a simpler model to interpret based on the activations generated in the voxels called the PrAGMATiC model. The PrAGMATiC model is generated through a Bayesian algorithm that produces larger regions of the brain, 128 areas in the right hemisphere and 192 areas in the left hemisphere, that are general associated with a particular category of semantic stimuli, in this case social, violent, both, or neither. This allows researchers to understand generally where in the brain certain semantic categories had increased activation. Each voxel model will produce a PrAGMATic model, allowing researchers to generally understand what areas of each cortex are increasingly activated or deactivated when exposed to culturally associated dialects and slang terms. In addition, we can see if societal stigma influences how one perceives terms associated with women and LBGTQ+ people. It is hypothesized that due to the small sample size of the original semantic atlas study, the maps in these participants may only be resemblant of the original study. The activation of the regions activated by both social and violent regions would be hypothesized to be correlated with the prevalence of past abusive social relationships.

These potential future studies transition from focusing on literary anecdotes of the Indo-Caribbean experience to how the age of indenture impacts the current generation of Indo-Caribbean patients. Through understanding the state of racial bias, preventative health education, cultural bias, and the neurological impact still present in today’s patient population, clinical initiatives geared towards Indo-Caribbean populations can be targeted more efficiently and directly towards the specific ailments still disproportionately influencing this sub-section of the Caribbean population.
**Conclusion**

The Indo-Caribbean is a unique population that within a century and a half moved from India to the Caribbean to the remaining regions of the world, including the United States and Canada. Along the way, Indo-Caribbeans persevered through colonial brutality, gender-based violence, and political unrest. Through the study of the Indo-Caribbean community through a neuroscientific lens using Indo-Caribbean fiction, it was revealed the high degree of social defeat and dehumanization experienced throughout this population, especially for women, LGBTQ+ people, and mixed-race people, in these three novels. This was portrayed through the barriers to financial freedom in *A House for Mr. Biswas*, the unequal treatment of minorities in the Caribbean plantation system in *Aurore*, and the extreme influence of gender roles for women and prejudice against LBGTQ+ people in the Caribbean in *Valmiki’s Daughter*. Past studies have revealed that chronic exposure to circumstances promoting dehumanization and social defeat increases one’s tendency to experience an array of neuropsychiatric disorders, including depression, anxiety, and substance abuse because of manipulations of neural networks in executive function and emotion regions. It has also been shown that the regions that are semantically activated by stimuli signaling violent and social meanings are that same regions active in the formation of dehumanization and intergroup bias in the inferior frontal and inferior parietal cortices. It is important to continue to study the Indo-Caribbean population through a cultural lens because although they share the same ancestry with Indian populations, their experiences in the Caribbean during the 19th and 20th centuries distinguish their sociocultural environments, which may influence their neural processing. A key next step is to work directly with Indo-Caribbean populations to better understand the underpinnings of the prevalence and causes of substance abuse, anxiety, and depression and potentially tying it to their ancestry rooted in coerced labor.
Figure 1: Migration and memory: A infographic that demonstrates the migration of Indian indentured laborers across the British, French, and Dutch empires between 1830 and 1917 (The Economist, 1917).
Figures 2a and 2b: The semantic atlas model: (a) the right hemisphere of the brain using the PrAGMATIC atlas modeling system with a color-coded key in the bottom left, the pink and red regions were of most importance because of their relation to violent and social meaning (b) the left hemisphere of the brain using the PrAGMATIC atlas modeling system with a color-coded key in the bottom left, the pink and red regions were of most importance because of their relation to violent and social meaning (Huth et al. 2016).

Figure 3: Dehumanization Regions The regions of the brain activated during fMRI dehumanization study are highlighted in blue, specifically the dorsomedial precuneus (PC), inferior frontal cortex (IFC), and inferior parietal cortex (IPC) (Bruneau et al. 2018).
Citations


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