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Welcome to the 7th issue of Scholarly Review, a multidisciplinary journal providing emerging scholars with a publication outlet in a quality, open-access, peer-reviewed student journal. Issue 7 contributors uphold the legacy of Scholarly Review as a home to well-written essays from well-educated young scholars.

Vanessa Catalano offers solutions to improve public health and wellbeing in Venezuela, a country whose health system is currently at a breaking point in the face of low immunization rates and water contamination.

Olivia Cui discusses the state of the research on the effects of social relationships on adolescent academic success and offers potential explanations for the phenomenon.

Siyi Ding does a deep dive on a refugee camp in Bangladesh, identifying the problems currently plaguing the population and advocating for a three-pronged approach to solving compound issues.

Carolyn Foo determines the quality and quantity of evidence purporting to prove that music improves cognitive development, engaging with studies that show a positive correlation between music training and cognitive improvement.

Isabella Hu explores the literature on inducement of chromosomal instability in cancer therapy, breaking it down into treatment pathways and finding an association between high instability and drug efficacy.

Aspen Lee reviews the way in which a mutation gene in breast cancer can influence treatment, effectively organizing and analyzing a section of the vast literature on gene TP53.

Karen Wang clarifies the connection between hearing music and regulating emotions in order to increase the effectiveness of music therapy.

Madison Zhan examines the obstacles faced by Asian immigrants in the US healthcare system, guided by the results of a set of interviews, and charts a path for future researchers studying healthcare access or health inequalities.

The aforementioned researchers should feel proud of their ability to produce work that stands out in a competitive environment, and we are honored to provide a venue for the fruits of their intellectual curiosity.

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Repairing the Public Health Crisis in Venezuela

By Vanessa Catalano

Author Bio

Vanessa Catalano, a junior at Marymount High School in Los Angeles, has an unwavering commitment to the fusion of public health advocacy and her Latin heritage. Her participation in her school community is evident through her leadership and active involvement in many activities. Vanessa is the co-founder and co-president of the Pre-Med Club, contributes to the school newspaper as a features section editor, and is a player on the varsity volleyball team. She amplifies her connection to her Latin roots as a writer for her school's Spanish newspaper. Additionally, she further explored and gained insights into her passions through an internship with a plastic and reconstructive surgeon. This diverse range of experiences supports her pursuit of addressing and repairing the public health crisis in Venezuela.

Abstract

Venezuela is struggling with a multifaceted crisis encompassing political, environmental, economic, and health issues. The healthcare system in Venezuela, known as Barrio Adentro, is in decline, leading to the deterioration of the health and well-being of its citizens. These harmful causes include low immunization rates, water contamination, and the effects of droughts, in addition to the corruption of their government. Following these root issues, this paper explores these challenges in Venezuela's healthcare system and proposes solutions aimed at improving public health in Venezuela. These proposals include the introduction of a water and food stamp program, the allocation of a reserved amount of clean water for hospitals, increased transparency in government spending, the mass production of drought-resistant crops, water recycling initiatives, and the expansion of filtration systems. The degradation of Venezuela's healthcare system is alarming, and the responsibility for implementing positive change rests upon the global community. The solutions in this paper serve as a foundation for revitalizing the healthcare system and emphasize the urgent need for intervention and reform. Ultimately, these efforts will promote and lead to better health and quality of life for Venezuelan citizens.

Keywords: Venezuela, Public health, immunization, water contamination, droughts, health crisis, environmental crisis, Barrio Adentro, disease, economic collapse

Introduction

Government corruption, economic collapse, and climate-induced environmental disasters have led to a severe public health crisis in Venezuela. Addressing this crisis necessitates comprehensive reforms in health-related policies and increased investment in Venezuela's free healthcare system. Despite possessing the world's largest oil reserves and being a major oil exporter, fewer than 2% of the workforce is employed by this industry (Caraballo-Arias, 2015). The plummeting price of oil since 2014 as well as political and economic instability have pushed Venezuela into an economic recession (Caraballo-Arias, 2015). 48% of Venezuela's population is living in extremely poor, dire conditions (Caraballo-Arias, 2015). In addition, Venezuela is also struggling economically and has a staggering minimum monthly wage of 130 bolivars or 5.40 USD (Singer, 2023).

Venezuela, a federal republic under the leadership of President Nicolás Maduro, faces criticism for its authoritarian style of governance. Venezuela's current healthcare system is known as Barrio Adentro and it was established by the Chávez government in 2003. However, it has come under scrutiny for its corruption and its lack of investments. Venezuela's current healthcare system is underfunded, understaffed, and has weak healthcare policies. This crisis is further exacerbated by a significant exodus of citizens and healthcare workers, with 10% of Venezuela's entire population becoming diaspora (Osorio, 2019). In addition to its healthcare system, Venezuela's hot and humid tropical climate and the dangers of water contamination have further caused instability within the nation through droughts, resource depletion, and the spread of waterborne diseases (World Bank Climate Knowledge Portal authors).

This paper serves as a literature review of public health in Venezuela, specifically focused on its failing health system Barrio Adentro, low immunization rates, water contamination issues, and the effects of droughts. This paper is also framed within the context of the United Nations Sustainable Development (SDGs) Goals with particular relevance to SDGs 2, 3.3, 3.9, and 13.2. SDG 2 emphasizes the need for an end to world hunger, and the need for improved food security, nutrition, and agriculture.

SDG 3 calls attention to promoting health and well-being for all ages, and 3.3 emphasizes ending epidemics like AIDS, tuberculosis, malaria, water-borne diseases, and others by 2030. SDG 3.9 talks about reducing deaths from water pollution and contamination. SDG 13 focuses on the urgency of combating the issues of climate change, and 13.2 highlights integrating climate change measures into policies and strategies (United Nations). The primary objectives of this paper are to critically assess Venezuela's current healthcare crisis and propose viable solutions to aid this nation.

Methodology

In this paper, Google Scholar served as the primary search engine and there were 24 literary references. A substantial portion of the information was derived from *The Lancet*, a reputable medical journal founded in 1823. The significance of *The Lancet* lies in its focus on addressing urgent, medical concerns in our society.

Additionally, the Center for Strategic and International Studies (CSIS) offered valuable research for this paper. This source was beneficial because it was comprehensive research and relevant statistics that directly aligned with the themes addressed in the paper.

The research methodology encompassed a critical analysis of the existing flaws and detriments of the current Venezuelan healthcare system, Barrio Adentro. Through an extensive review of scholarly literature and data, solutions were explored with the aim of effectively enhancing and improving the overall health and well-being of the Venezuelan population.

Discussion

Venezuela's healthcare system, Barrio Adentro, is failing and misleading its citizens through a lack of a promised investment in its healthcare system and corruption. It was meant to redress social inequities and revolutionize healthcare experiences; the program also gave access to free primary and preventive health services by creating thousands of neighborhood clinics staffed by Venezuelan and Cuban medical workers. Barrio Adentro was rooted in poor communities and relied on neighborhood

activists to start clinics and its doctors were celebrated for their solidarity with poor patients (Amy Cooper & Oscar Feo, 2022). However, soon this system began to decline. Funds that were destined for the construction of hospitals and the purchase of medicines disappeared. Even though millions of dollars were invested in the healthcare system, all hospital interventions, from surgeries to laboratory tests, were reduced by 75% between 2005 and 2011. Furthermore, according to estimates from NGO Transparencia Venezuela, at least \$29.7 billion was spent between 2005 and 2014, but this investment is not apparent in the quality of Venezuela's healthcare (Galbadón, 2018). According to the National Hospital Survey, there was a 47% shortage of supplies in emergencies and a 72% shortage of supplies necessary for operating rooms in the first half of 2022 (Barbar et al., 2023). Additionally, ENCOVI data matches with off-the-record reports that claim that over 80% of the 13,496 popular clinics acknowledged by the government in 2017 were closed, and as of 2017, only 1,094 of the supposed 30,000 Cuban doctors in Barrio Adentro remained in Venezuela. Moreover, there has been a 50% drop in medical staff because healthcare professionals, scientists, and professors are leaving Venezuela and disease infections have skyrocketed due to shortages of essential drugs (Osorio, 2019; Hotez et al., 2017).

In line with Sustainable Development Goal 3, which emphasizes promoting health and well-being for all, a feasible solution would be for the government to actually invest the money they proposed to the Venezuelan healthcare system, Barrio Adentro, and be held accountable for the correct amounts owed by providing evidence of the transactions. This would be effective in improving healthcare in Venezuela because it would allow the system to have funding for essential supplies, vaccines, and a clean water supply. In addition, it would force the government to be held accountable for their spending, so they could no longer mislead Venezuelan citizens through a lack of transparency.

The dire healthcare statistics further emphasize the urgency of reform. In 2019, there were 467,421 cases of malaria in Venezuela, which was a 1200% increase compared with the year 2000; and in 2017, Venezuela's low immunization coverage contributed to outbreaks of diphtheria and measles (Galbadón-Figueira et al., 2021). Additionally, over

100,000 Venezuelans have HIV but lack the necessary anti-retroviral medicine for treatment. The lack of necessary drugs and vaccines in Venezuela can cause the resurgence of yellow fever, dengue, vector-borne parasitoses, and death. Venezuela has already taken steps in the right direction through accepted support in the form of medical supplies and COVID-19 vaccines from allies like Cuba, China, and Russia (Bliss and Burke, 2022). Furthermore, there are many United Nations agencies, like UNICEF and PAHO, that operate in Venezuela. They offer guidance and support to social service agencies and government health (Bliss and Burke, 2022).

However, Venezuela needs even more assistance, in the form of accepting help from other countries and NGOs, or non-governmental organizations. For instance, the US reports that it provided at least \$80 million to support NGOs and international organizations, specifically related to improving and delivering water, sanitation, and hygiene (Bliss and Burke, 2022). Another instance is Peru, which wanted to send drugs and food to Venezuela, but were rejected out of Maduro's fear of being viewed as a failing government (Casey, 2016). Thus far, Venezuela has also refused help because Maduro and the government believe that it would allow the United States and other governments they view as hostile to have an opportunity to influence Venezuelan citizens. Therefore, they put political control over their population's health. Accepting this help would give Venezuela access to necessary treatments and vaccines without causing further financial devastation and turmoil. For instance, Venezuela needs anti-retroviral medicine for HIV treatment, and accepting help has a better chance to provide that. This would be crucially effective in Venezuela because currently, Venezuela has one of the lowest rates of routine immunization coverage, and it shows in their elevated cases of disease (Bliss and Burke, 2022). Therefore, expanding the availability of vaccinations by gaining vital supplies would improve public health drastically.

In 2018, the United Nations Food and Agriculture Organization recognized that climate change has had a significant effect on agriculture and food security, and according to the Ministry of Electricity, Venezuela's rainfall has measured 50 percent to 65 percent lower than normal (Graterol, 2023) and (Schneider, 2016). Production of

agriculture, including main crops like rice and corn, has plummeted to approximately 60% within the last 20 years and thus, has driven inflation higher (Rendon et al., 2019). This fall in agricultural production was followed by a significant nationwide weight loss of 24 pounds in 2017 (Osorio, 2019; Rendon, 2019). In addition, in 2019, the United Nations World Food Programme determined that 92% of the Venezuelan population suffered from food insecurity, primarily due to hyperinflation rendering the basic necessities of groceries unaffordable (Otis, 2022).

A focus should be placed on prioritizing the mass production of drought-resistant crops. This would create more foods without hindrance from droughts and a lack of water, and they could be mass-produced to help feed the immense population without costing people a high percentage of their money. Some of these foods that are best for drought tolerance are lima beans, corn, quinoa, and squashes (Peyster). Moreover, I propose the idea of creating policies that add food stamps as a part of the government's duty in Venezuela, like the food stamps system in the United States. I believe after accepting help and supplies from other countries, Venezuela should supply its lower to no-income citizens with food stamps. These stamps are government-issued coupons that are redeemable for food and given to those in dire need of these necessities. These solutions align with the United Nations' Sustainable Development Goal 2 through the promotion of eradicating hunger, improving sustainable agriculture, and an end to food insecurity for all.

Even though Venezuela is among the top 15 countries in renewable fresh-water resources, Venezuela has a failing water supply system, stemming from a lack of investment in infrastructure, corruption, and failed government policies (Rendon et al., 2019; Scull, 2020; Rendon, 2019). According to the NGO Agua Sin Fronteras, 82 percent of Venezuela's inhabitants are exposed to the consumption of unsafe water due to inoperable water treatment plants, and nearly 8 out of 10 Venezuelans don't have continuous access to clean water for basic sanitation and drinking (Graterol, 2023). The lack of clean water has also led to diarrhea, typhoid fever, tuberculosis, malaria, Zika virus, dengue, and hepatitis A (Hernández, 2029). Furthermore, 79 percent of operating facilities in Venezuela don't have any water access (The Lancet, 2018), and water contamination is leading

to an increase in infection from waterborne diseases, especially in children (Rendon, 2019). In Caracas, Venezuela's capital, the production of clean water depends on three systems of water treatment and pumping known as Tuy 1, Tuy 2, and Tuy 3, and together use 14 treatment plants and 147 pumping stations (Scull, 2020). Both Tuy 1 and Tuy 2 are at 50% capacity and the constant electric power shortages affect the function of the pumping system (Scull, 2020), thus reducing the supply of drinkable water to the population. In 1999, there were 20,000 liters per second of drinkable water in Caracas, but in 2019 there were only 14,000 liters per second. Since 1982, a fourth system, Tuy 4, has been under construction with hopes of creating clean water, but it has not been completed (Scull, 2020).

In response, repairing and building more wells in Venezuela and making this water drinkable through a filtration system allows for a nationwide base level of water across cities in Venezuela; thus, allowing more potable water to be distributed and used. In addition, Venezuela should implement policies of recycling water; rather than letting water run down the drain, water can be collected, cleaned, and run back through the system. This recycled water could be used for necessary processes like watering land and crops. Moreover, I believe it is critical that a certain amount of water should be reserved for hospitals across Venezuela. This would improve healthcare in hospitals for both patients and healthcare workers, leading to a cleaner and safer nation. Much like food stamps, I propose the idea of water stamps in Venezuela. These water stamps would also be coupons given out by the government to lower to no-income citizens would allow people to receive drinkable water, which is an absolute necessity. This approach to addressing Venezuela's water insecurity issues is in accordance with the United Nations' Sustainable Development Goals 13, 3.3, and 3.9. Through the improvement of water infrastructure, increasing access to clean water, and enhancing water management practices, these measures reflect the message of SDG 13 about combating climate, like water insecurity because of droughts. Additionally, these proposed strategies relate to SDGs 3.3 and 3.9 because they aim to curb the spread of diseases like malaria and tuberculosis, as well as reduce deaths from water contamination and pollution. Thus, these proposed policies relate to the global goal of reducing the burden of waterborne epidemics and promoting public health.

The pressing challenges facing Venezuela's healthcare system, water supply, and agricultural sector need urgent solutions that align with the United Nations Sustainable Development Goals; by addressing these issues, there is potential for improved healthcare, the alleviation of food insecurity, and the combatting of waterborne diseases.

Conclusion

Venezuela is in deep financial, environmental, migration, and health crises. The current healthcare system, Barrio Adentro, is leaving citizens in poor health, starvation, thirst, and vulnerable to disease, thus making their current healthcare system detrimental to their well-being. The Barrio Adentro system is not getting the investment it needs to be able to supply citizens with their fundamental needs, like vaccines and water. A solution would be to hold the government accountable for investing by showing the public the actual transactions with the correct amount of money originally proposed with the system, in other words, providing its citizens with a financial breakdown of government spending. This would lead to an increase in health and a rise in immunization rates due to an increase in resources such as vaccines and medication.

Moreover, another idea to improve immunization rates in Venezuela is accepting help from other countries and non-governmental organizations, specifically focusing on delivering water, and improving sanitation and hygiene. Accepting this assistance would be immensely beneficial because it would allow Venezuela to have access to fundamental supplies without causing further financial strain. This would save many lives, like people with HIV who can finally receive the treatment they deserve. Making vaccinations a more common practice would increase immunization rates because of new supplies and would improve health in Venezuela tremendously.

In addition to low immunization rates, Venezuela is also struggling due to the climate's effect of droughts. Some solutions are the mass production of crops that don't require a lot of water and irrigation, only soil, and food stamps to alleviate hunger and starvation rates. This would be effective in Venezuela because it would lead to the mass

production of more foods that are currently overpriced and becoming a luxury, and it would feed and nourish more Venezuelans, many of whom are struggling from starvation. Furthermore, water and food stamps would be immensely effective in Venezuela because they would provide people with essentials that they are dying without. This would improve starvation and dehydration rates, and save lives in Venezuela.

Additionally, improving the issue of water contamination would immensely benefit the Venezuelan population. I propose repairing and building more water plants in Venezuela and filtering them to allow for an increase in water production, and the recycling of water to be used for necessities like growing crops. Moreover, it is critical that a significant amount of water should be reserved for hospitals across Venezuela because both patients and healthcare workers are in dire need of this implementation.

Citizens, both adults and children, are suffering and dying because they are stuck in a broken healthcare system, which they can't control. The dire state of Venezuela's public health system calls for a multifaceted approach with solutions that not only address immediate concerns but also align with the broader objectives of the United Nations Sustainable Development Goals. The relevance of this paper lies in its potential to alleviate the suffering of the people of the Venezuelan population through the repairing of the Barrio Adentro health system and fostering a healthier future for Venezuela.

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The Connection Between Social Relationships and Adolescent Academic Success

By Olivia Cui

Author Bio

Olivia Cui is a senior at Summit High School interested in psychology and cognitive science. She is the President of Math Club and Co-president of American Sign Language Club at her high school. In her free time, Olivia loves reading and playing piano.

Abstract

Adolescence is a time of heightened susceptibility to social influence; teens look to important social figures to help guide their decision-making. Thus, their social relationships hold power in shaping how adolescents regard their education. Three main factors that impact a student's academic performance are social relationships with parents, teachers, and peers. These relationships vary in how they influence academic achievement: for parent-child relationships, the parent's involvement with the child's education affects academic performance, for peer-to-peer relationships, social norms regarding education is the key source of influence, and for teacher-student relationships, the teachers' perception and expectations of their students has the greatest impact on students' academic performance. This paper discusses current research on the effects of social relationships (i.e., parent-child, peer-to-peer, and teacher-student) on adolescent academic success and offers explanations as to why these social relationships have such a significant impact on academic success.

Keywords: Social relationships, academic performance, adolescent education, adolescent psychology, parent-child relationships, peer relationships, teacher-student relationships, self-perception, academic achievement, social influence

Introduction

Academic success in America varies greatly: some students conquer factoring polynomials in middle school, while their peers struggle with one digit multiplication. The implications of childhood academic performance extend well past adolescence and into adulthood, impacting educational attainment and employment (Gevrek et al., 2015). Myriad factors contribute to these students' academic prowess, but social relationships in particular have been discovered to improve students' academic performance by increasing students' academic motivation (Wentzel & Wigfield, 1998). Familial relationships, friendships with peers, and teacher-student relationships comprise three key social relationships in adolescents' lives. Since adolescence is a time of heightened susceptibility to social influence, teens look to important social figures to help guide their decision-making. For example, involvement in peer groups that value high academic achievement may encourage an adolescent to strive for better grades. Parents who value education may pass this value on to their children, potentially resulting in strong academic records. Teachers with trusting relationships with their students may help the student feel supported and lead to more effective learning. This paper discusses current research on the effects of social relationships (i.e., parent-child, peer-to-peer, and teacher-student) on adolescent academic success and offers explanations as to why these social relationships have such a significant impact on academic success.

Parent-Child Relationships

Parental involvement in their child's education is one characteristic of the parent-child relationship that influences an adolescent's academic success. This may manifest in the parents initiating school-related discussions with their child, helping them with schoolwork, or encouraging their child to pursue academic activities instead of noneducational activities (Jafarov, 2015). Regardless of the type of parental involvement, an important factor that drives parental involvement is the parents' expectations of their child's performance in school. Research has indicated that by improving their child's self-perception of their academic competence, parents can increase their child's academic success (Gonzalez-Pienda et al., 2002). Self-perception of academic

competence can impact academic achievement by boosting self-esteem or fostering a positive mindset regarding learning (Banks & Woolfson, 2008). Parental expectations may shape their child's perception of their academic abilities, which has been shown to predict academic outcomes (Pajares, 1996). In contrast, parental involvement in the form of supervision at home does not have as high a correlation with a child's academic success as parental expectations do (Fan & Chen, 2001). Parental supervision may not be as accurate a predictor of academic performance as parental expectations are because supervision may only be implemented after low academic achievement, as opposed to being implemented before any academic results. However, parental expectations are not the only element of parent-child relationships that affect academic success. Another factor that moderates the influence of parent-child relationships on academic achievement is socioeconomic status.

How a student's parents regard education in terms of importance will impact the student's relationship with schoolwork. This may then influence parental expectations of a student's success in school, indirectly shaping the student's self-perceived competence at school. Studies have shown that a student's perception of their competence may be the factor that is both affected by parent expectations and responsible for their own academic achievement (Loughlin-Presnal & Bierman, 2017). Higher parental expectations from various demographics were all correlated to the student's higher academic performance, so regardless of background, parental expectations may increase the student's self-perception of their educational competence and thus positively influence their academic achievement.

The influence of the parent-child relationships on adolescents' academic success may be connected to the family's socioeconomic background because students living in poverty tend to demonstrate lower academic achievement than those not living in poverty (Lee & Bowen, 2006). In fact, participation in school reduced or free lunch programs, one indicator of socioeconomic hardship, has been associated with worse academic performance (Lee & Bowen, 2006). Children who qualify for reduced/free lunch may be hungry during the school day, which negatively affects their ability to focus on schoolwork, or not have the resources for extra academic help. Their lower academic achievement may have resulted

from few parent-child discussions about education or their parents' low expectations for the student's academic performance, which were reported by parents whose children participated in the free/reduced lunch program (Lee & Bowen, 2006). Children living in low-wage households may have parents who work all day and are not able to support their children's academic pursuits, which could lead to their academic performance suffering. It is important to take into account that parents whose children did not receive free/reduced lunch reported more attempts at restricting their children's time for enjoyment and focused more on reading time than parents whose children received free/reduced lunch (Lee and Bowen, 2006). It may be that wealthier parents have more time and resources to monitor their children's activities and academic pursuits. Thus, the influence of the parent-child relationship on adolescents' academic success interacts with factors such as socioeconomic status. Schools should be sensitive to the fact that students from low socioeconomic backgrounds may need additional resources and support to help them succeed academically.

Parent-child relationships are often shaped by the time that the parents have available for their child, which indirectly impacts the student's academic success. Differences in how parents engage in their children's education can be attributed to a variety of barriers that low-income or marginalized racial and ethnic groups face. For instance, lower education is a major contributor to the wage gap in the United States (Smith & Fernandez, 2017). This means parents in low-income households are less likely to hold degrees higher than a high school degree, and as such, may not pass on a favorable mindset about education to their child or have the experience to guide their children (e.g. a parent with only a high school education is less likely to know about the college admissions process) (Leww & Bowen, 2006). The current education system in the United States targets middle-class students, so low-income students and students from other demographics may have a more difficult adjustment to school (Lee & Bowen, 2006). Parents of these students may not be able to participate in school events, which translates to teachers thinking that the parents may not value education as much, resulting in lower teacher ratings of a student's academic performance (Lee & Bowen, 2006).

Peer Relationships

While parent-child relationships do impact students' self-perception and thus their academic achievement, peer relationships also influence how much effort students put into their school work and how they view their academic abilities. Many friendships are shaped by similar backgrounds and interests, and adolescents value feeling accepted and well-liked by their peers (Lerner, & Steinberg, 2009). Research has shown that peer pressure and the need to conform in adolescence is powerful in influencing students' actions (Santor & Kusumakar, 2000). Through the values of peer groups, academic performance may be impacted by students' relationships with their peers. For example, if the adolescent is part of a social circle where high grades are respected, they may be more motivated to perform well academically (Wentzel & Wigfield, 1998). Also, research has shown that with peer support, students' attendance strengthens, which may be because friends allow school to be more of a positive experience (Rosenfeld & Bowen, 2000). Therefore, peer relationships may place pressure on students to perform well academically so that they will fit in with their social circle.

The effect of peer relationships on academic success may also be related to the competitive or noncompetitive nature of the relationships. Research has shown that cooperative learning during middle to high school is more effective at inspiring a desire to learn and instilling permanent knowledge than competitive learning (Wentzel & Wigfield, 1998). Cooperative learning is defined as the learning environment where mastering the material is the goal, not outcompeting peers. Students work together to learn in cooperative learning (Wentzel & Wigfield, 1998). In contrast, competitive learning is defined as the learning environment where comparison between peers is emphasized, such as in a teacher style where only the highest test scores are rewarded (Wentzel & Wigfield, 1998). The finding that cooperative learning facilitates greater student achievement could indicate that peer friendships help students achieve higher grades, since cooperative learning encourages students to help each other instead of one student's loss being another student's gain. As a result of the emphasis of teamwork, cooperative learning is also linked to students prioritizing learning for the

sake of gaining knowledge over social comparison and having increased confidence in their academic abilities (Wentzel & Wigfield, 1998). Gamification, a competitive learning teaching style where students earn points for tasks such as participating in class discussions and have their points tracked on a public leaderboard, has been linked to a decrease in both student motivation and confidence in their academic abilities, and therefore negatively impacts academic performance (Hanus & Fox, 2014). As such, peer relationships may influence the mindset that a student holds about school: if a student has many friends at school, they may be more likely to enjoy school and put more effort into their schoolwork, raising their GPA. In fact, lower levels of school dropout and increased GPA have been linked to higher school satisfaction (Martinez et al. 2004).

Since friendships are more likely to form within the same class because the students are more likely to interact and work together, peer relationships may be affected by the teacher's teaching style. Research has not yet been conducted to study whether more friendships form in a specific style of teaching (e.g. lectures vs. seminar-based) than other styles. However, in classrooms that incorporate social and emotional lessons, the social and emotional well-being of students was not the only improvement—many previously low-achieving students improved their academic performance as well (Ashdown & Bernard, 2012). The teachers who taught social and emotional lessons reported that the students had better emotion management and displayed more engagement during academic subjects (Ashdown & Bernard, 2012). The results were not limited to any gender nor ethnic and racial backgrounds. In classrooms where social and emotional lessons were taught, students exhibited greater growth in their reading levels than classrooms that did not receive social and emotional lessons. Peer relationships in the school environment may allow students to boost their social and emotional well-being, thereby increasing their perception of their academic abilities and improving their academic performance. Altogether, despite various motivations for achieving high grades, supportive peer relationships allow students to focus on learning at school and increase academic achievement.

Teacher-student Relationships

Similar to how parental expectations greatly impact the student's motivation in school, teacher expectations shape their relationships with their students and therefore influence their students' academic performance. Throughout an adolescent's education, they will interact with several different teachers, and their relationships with these teachers are highly important to their overall educational experience (Frymier & Houser, 2000). As one of the most powerful authority figures at school, a teacher is key not only academically, but emotionally as well. Students' self-perceptions of their abilities correlates to their actual success (Pajares, 1996), and teachers play an influential role in how their students see themselves (Rosenfeld et al., 2000). For example, middle-school students with a stronger teacher-student relationship had higher self-esteem levels, thus increasing their academic success (Fredriksen & Rhodes, 2004).

Strong teacher-student relationships are characterized by the student's trust in the teacher, helping them feel safer in the school environment and more competent academically (Hamre & Pianta, 2006). However, a stronger teacher-student relationship's correlation to higher academic success and the influence a teacher has on their student's academic performance may be affected by the teacher's perception of their student. Instead, these correlations may be indicators of the Pygmalion effect or halo effect, where teachers may be inclined to rate students with better grades with higher self-esteem (Berger et al., 2011). Research has shown that teachers with low expectations for a student may be more hostile in their interactions, make less eye contact with them, and give them easier tasks (Peterson et al., 2016). Teachers may also subconsciously grant more support, whether academic or socially, to students that achieve higher grades (Berger et al., 2011).

Furthermore, adolescents are able to identify whether teachers have high or low expectations through their nonverbal behavior (Peterson et al., 2016). By creating and reinforcing expectations for a student's success academically, teachers are also forming the same expectations in the student's mindset. Since stronger teacher-student relationships are usually linked to more frequent teacher-student

interactions (Fredriksen & Rhodes, 2004), the teacher may receive the impression that the student cares about school and develop better expectations for the student's academic outcomes, influencing the student's perception of their academic abilities and their academic achievement.

Another important aspect of the teacher-student relationship is that teachers are likely to play the largest role in shaping a student's attitude towards academics, and a positive attitude supports functioning in the brain regions responsible for learning and memory, allowing for higher academic achievement (Chen et al., 2018). One way teachers can cultivate a positive attitude towards learning and improve academic performance is by teaching their students to adopt a growth mindset, whether through modeling or lessons about social and emotional well-being (Moser et al., 2011). A growth mindset is defined as the belief that mistakes are necessary steps in learning and improvement, whereas a fixed mindset is the belief that mistakes are not opportunities for growth (Moser et al., 2011). A strong teacher-student relationship may help the student adopt a growth mindset, which has been connected to increased accuracy after making a mistake, and thus improve their academic performance (Moser et al., 2011). In addition, research has found that teachers with growth mindsets further the development of a growth mindset in their students, which fosters a positive attitude towards schoolwork and leads to higher academic performance (Mesler, 2021). On the contrary, teachers who hold a fixed mindset lead to lower student expectations of their own academic performance (Mesler, 2021). Teacher-student relationships thus wield immense power in influencing students' academic performance by molding a student's perspective on their academic abilities.

Conclusion

Three main factors that impact a student's academic performance are social relationships with parents, teachers, and peers. These relationships vary in how they influence academic achievement: for parent-child relationships, the parent's involvement with the child's education affects academic performance, for peer-to-peer relationships, social norms regarding education is the key source of influence, and for teacher-student relationships,

the teachers' perception and expectations of their students has the greatest impact on students' academic performance.

Strong parent-child relationships, peer-to-peer relationships, and teacher-student relationships all positively influence academic performance despite varying socio-economic statuses and cultures because social relationships mold a student's mindset and attitude towards school. In doing so, social relationships help develop the student's self-perception of their academic prowess, increasing their academic success. By learning how to interact with their peers, teachers, and parents, students also build social-emotional skills, which affect students' academic performance (Rhoades et al., 2011). However, research has not yet been conducted to discover if social relationships help improve academic success by developing social-emotional skills, or if better social-emotional skills lead to stronger social relationships, which then increases academic success. It is also important to note that social-emotional skills may correlate to self-esteem, which impacts academic achievement by regulating the students' self-perception of their academic abilities (Sklad et al., 2012). For now, schools and teachers should seek ways to allow students to bond with each other and their teachers. This may mean allocating time for lessons promoting social and emotional skills or a period of free time where teachers can play games with their students. By understanding the importance of social relationships, schools can take action to help their students learn better than ever.

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Shedding Light on the Limbo:

A Case Study Evaluating the Problems in the Kutupalong Refugee Camp and How Aid Agencies Provide Support to Address the Issues

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Author Bio

I am currently a high school senior at Shanghai SMIC Private School International Division. I am interested in a wide range of humanities and social science subjects such as anthropology, sociology, and psychology and their interplay with social justice issues. I am also passionate about various types of community service, such as tutoring, helping women in my community pursue their passion for sports through my nonprofit, and organizing club booths at school. In the future, I hope to learn and achieve more about women's empowerment and provide more support with my own skills.

Abstract

This paper examines one particular refugee camp, Kutupalong Camp in Cox's Bazar, Bangladesh, which hosts refugees fleeing religious persecution in Myanmar. I identify several key problems that have arisen in this camp: lack of education and inclusion, food insecurity and malnutrition, and gender-based violence. Various actors are trying to address these problems by working with host communities, addressing structural issues, and providing knowledge to refugees. Actors need to recognize that the three problems are interconnected, and therefore equal attention and resources should be given to each of them to better address the humanitarian problems in Kutupalong camp.

Why was the Kutupalong Camp established? What humanitarian problems does it seek to solve? What are some ways that various actors have tried to solve humanitarian problems within the camp?

Keywords: Humanitarianism, Humanitarian Crisis, Kutupalong Refugee Camp, NGO, Educational Inequality, Sexual Violence

Introduction

As we live in this intertwined world, multiple events can occur simultaneously. While we as outsiders are discussing the seemingly distant scenes in the news, there are people who are taking action right now to help the underprivileged world, rebuilding people's homelands because they were destroyed by another political party, or setting up emergency shelters to prevent homelessness due to rising global temperatures. Each movement behind such actions has been carried out with tremendous human power and countless efforts to alleviate the pain and suffering of these groups of people. All of these actions are attributable to humanitarianism - the promotion of human welfare. Humanitarian action, on the other hand, is the compassionate response to extreme and specific types of suffering caused by organized human aggression and natural disasters (Slim, 2015). International and local aid organizations have been working for decades to solve problems related to poverty, forced migration, sexual violence, etc., and the work has never stopped. It is heartening to see humanitarian agencies working together to provide relief to the underprivileged world and minimize the suffering of people. In short, humanitarian aid reflects a very human reaction of compassion and caring to the brutality and destruction of war and calamity, and it is a generally accepted ethical practice (2015).

One scenario where this help is often needed is refugee camps. Refugee camps, according to the United Nations, is "temporary accommodation for people who have been forced to flee their home because of violence and persecution." The establishment of refugee camps could be traced back to the 1990s, and today, nearly four million refugees reside in planned or self-settled camps (UNHCR, 2016). Humanitarian aid agencies, such as the UNHCR (United Nations High Commissioner for Refugees), have been providing support for refugees to restart their lives. This paper examines one particular refugee camp, Kutupalong Camp in Cox Bazar, Bangladesh, which is mainly home to refugees fleeing religious persecution in Myanmar. This paper discusses the reasons for the camp's establishment, the types of humanitarian problems it seeks to address, and some of the ways in which various actors have attempted to address humanitarian problems within the camp.

Literature Review

In this literature review, I looked at some works that evaluate the purpose of refugee camps, history of camps, and some problems that have occurred in various refugee camps around the world.

A refugee camp is a reflection of recent development in humanitarian ethics. Resilience humanitarianism is a paradigm founded on the idea that "people, communities, and societies have the capacity to adapt or recover from tragic life events (Hilhorst, 2018). Such tragic events include violence, natural disaster, as well as ethnic and religious persecution. Refugee camps can be powerful means for communities to recover from tragic events (Mollica, 2014). Historically, refugee camps have emerged as a response to forced migration starting in 1915 (McConnachie, 2016). As compared to their predecessors of the prisoner of war (POW) and internment camps, refugee camps tend to endure longer and carry a humanitarian mission, with international organizations and other actors carrying out humanitarian assistance within them (2016).

Refugee warehousing is defined as "the practice of keeping refugees in protracted situations of restricted mobility, enforced idleness, and dependency - their lives on indefinite hold (USCRI, 2019)." Refugee warehousing runs counter to the fundamental human rights specified in the 1951 Convention, which encompass essential entitlements such as the freedom to work (Articles 17-19), unrestricted mobility (Article 26), and access to education (Article 22). This practice also worsens prolonged refugee situations by depriving them of these rights (USCRI 2004b, 38). In addition to their criticism of refugee warehousing as a humanitarian practice, scholars also analyzed problems that arise in camps around the world.

One set of problems that refugee camps create is connected to the structures used to house refugees in the camps. Poor building and housing issues were common as a result of host nations' inattention and refugees' perceived inferiority. Thomson discovered that the Tanzanian government required Congolese and Burundian refugees to build the camps with sun dried mud brick and thatched roofs so that they could be dismantled without a trace in the research studying Congolese Refugee Camps in Tanzania

(Thomson, 2014). The red mud of their huts and the camp atmosphere affected practically every aspect of Nyarugusu inhabitants' life, giving the camp a dirty feel (2014).

Another set are public health challenges such as disease outbreaks. Because refugees often live in crowded areas, there tends to be poor sanitation which causes public health issues. The International Rescue Committee indicated that following an outbreak of Cholera illnesses at Hagadera in Dadaab Refugee Camp in Kenya, at least three refugees died and 504 others were treated for acute dehydration (n.d.). UNICEF reported that there has also been an outbreak of 14 cases of measles in the Kakuma refugee camp due to drought and malnutrition issues among inhabitants (Tembo, 2023).

And lastly, some of these issues are social. The prominent ones include gender based violence and lack of resources. According to Smith, "assistance-related sexual exploitation" is a result of warehoused conditions in which women, girls, and young men are subjected to different types of "sexual concubinage," including "sexual abuse by aid agency employees (Smith, 2004)" Majok stated that due to limited resources, refugees are sometimes forced to compete with host populations for food, health care, and education services, resulting in the impression of "refugees as a burden" in the host country (Majok, 2019). Though these issues exist outside of the camp and are not created by it, life in the camp can create additional challenges, because there is a lack of accountability and because conflict usually affects marginalized people more.

Methodology

The data and information collected in this article are primarily from secondary sources published in online articles or peer-reviewed journals that contain mainly qualitative data accessible through either Google Scholar or Jstor. There is also a lot of primary and secondary information consisting of sources generated from various Non Governmental agencies' websites and reports, such as the UNHCR. Some of the sources are from authoritative journalistic sources such as the New York Times. I chose to do a qualitative case study on the Kutupalong refugee camp because it is currently the largest refugee camp in the world with a variety of problems. It is worth analyzing because it would give me a more holistic view of

all kinds of problems and how aid organizations are addressing them. Through the paper, I incorporated broader themes of the Research Practicum, such as humanitarian ethics, humanitarianism, and international aid. Some challenges did arise during the process. Due to time constraints, I was unable to directly interview the residents of the refugee camp, which is a drawback of my primary data. I took all of my primary sources from previously published refugee reports on aid websites.

Case Study and Empirical Background

The Rohingyas in Myanmar

The Rohingyas are an ethnic, linguistic, and religious minority of Myanmar and the Rakhine region (Rahman, 2010). They claim to be the descendants of Moorish, Arab, and Persian traders, as well as Moghul, Turk, Pathan, and Bengali troops and migrants. During the 15th to 19th century, Islam spread its influence over the Northern Arakan region, and many Rohingyas became Muslims. However, following the 1962 military revolution that brought Myanmar's present dictatorship to power, the Rohingyas were systematically denied their civil, political, economic, and social human rights, culminating in the 1982 Burmese Citizenship Act as the majority of the country were Buddhists. The Myanmar regime's (the State Peace and Development Council [SPDC]) campaign of extermination, ethnic cleansing, and genocide against the Rohingyas caused the present generation of Rohingyas to migrate to Bangladesh for safety (2010).

According to UN Refugees, thousands of Rohingya left Rakhine in August 2017, fleeing deadly assaults and communities in their homeland (UNICEF Bangladesh, n.d.). Thousands of families were slaughtered or split up, entire towns were set on fire, and there were numerous reports of breaches of human rights (UNHCR, 2021). This caused an unprecedented cross-border exile to neighboring Bangladesh, and within a few weeks, around 500,000 refugees entered Bangladesh in search of safety and shelter (UNICEF Bangladesh, n.d.). There are currently around 860,000 Rohingya refugees in Cox's Bazar, with more than half of them being children. They fled to Cox Bazar in search of stability, living quality lives, and possibly chances to continue education and jobs (n.d.).

The Refugee Camps in Cox Bazar

The Kutupalong refugee camp in Cox Bazar, Bangladesh, is now the world's biggest refugee camp (2019). It is home to around 800,000 Rohingya refugees who have escaped harsh persecution in neighboring Myanmar. The Rohingya have been placed in two refugee camps - Nayapara and Kutupalong, which are co-managed by the United Nations High Commissioner for Refugees (UNHCR) and the Bangladesh government (2019). Bangladesh's government ceased recognizing these Rohingya as refugees in 1992 (United States Bureau of Citizenship and Immigration Services, 2001). Following that, there were continuous efforts to "repatriate" a significant number of Rohingya refugees to Myanmar, however, many of those who were repatriated have subsequently returned. "Some refugees interviewed by UNHCR in 1992 said they did not want to return to Burma. UNHCR announced their withdrawal from the repatriations in December 1992, due to incomplete UNHCR access to the refugees and reports of forced returns and of abuse of refugees by camp officials (2001)."

Bangladesh has hosted over a million Rohingya refugees since August 2017 and is mobilizing resources to care for these individuals who have nowhere else to go. However, the situation in the camps in Cox Bazar is complicated. Since the refugees live in crowded areas, this raises the likelihood of landslides and heightens the chances of fires, where the Rohingyas struggle with housing, dwelling quarters, sanitation, lack of drinking water, education, and health difficulties (Islam and Siddika, 2021). International Humanitarian Agencies are providing support to alleviate the living conditions of Rohingyas and addressing some of the issues that arose in the camps.

Data Analysis: Humanitarian Aid in Kutupalong to Address Challenges

To provide timely and effective aid, humanitarian organizations work in each of the major fields of humanitarian action, such as water, health, nutrition, cleanliness, housing, and education (Islam and Siddika, 2021). This guarantees that the

individuals living in the refugee camp are accessible as simply as possible and that the supply of relief items is not imbalanced (2021). Fortunately, relief efforts have led to some positive changes for Rohingya refugees. Some challenges addressed are education and inclusion, food security and malnutrition, and gender-based violence.

Lack of Education and Inclusion

Education in refugee camps is often inadequate compared to the educational attainment rate for individuals worldwide. In a published report from the World Bank, a large portion of Rohingyas in Cox's Bazar hold a very low literacy rate with large gender gaps, and "school-aged children only had limited access to informal learning centers in camps at baseline (World Bank, 2021)." The report indicates that the 2019 Cox's Bazar Panel Survey baseline showed "only 60% of host adults in Cox's Bazar can read," one-third of the grown-ups has never attended school, while another 25% has only completed primary school (2021). This means that the literacy rate among refugees in Cox's Bazar is relatively low, and most do not even reach secondary school level.

Fortunately, the Bangladeshi government and humanitarian aid organizations have been aware of this problem for some time and have taken many steps to raise the educational level of refugees. Initiatives such as Children on the Edge, a child rights organization that supports marginalized children in Bangladesh, India, Uganda, Myanmar, and Lebanon, has worked on providing education for the Rohingya youths in the camp. The initiative has "established 75 Learning Centres which have all been running five days a week since June 2018, providing education for 7,500 children (Children on the Edge, 2023)." A total of 150 teachers from Bangladesh and Rohingya communities have received comprehensive training and are actively conducting daily classes: the training encompassed a wide range of subjects, including effective communication, child rights, health, hygiene, first aid, trauma identification, classroom management, and techniques to create an engaging learning environment (2023).

Moreover, on January 29, 2020, the Bangladesh government eased education regulations and authorized the implementation of the Myanmar Curriculum Pilot (MCP) within the refugee camps

(World Bank, 2021). The pilot program aims to focus initially on Rohingya students in grades 6-9, an older age group that currently faces limited educational opportunities compared to younger children. The curriculum's preparation includes a diverse range of subjects such as Burmese, English, mathematics, science, and social studies. Subsequent phases of the program are projected to extend access to education for students in various grades and cover additional subjects (2021).

UNICEF has been actively involved in providing education for Rohingyas, particularly youths who were unable to complete their studies in Myanmar. Ehsan, a 14-year-old teenager who lost both of his arms in an accident, is one notable example. Despite his loss of arms, Ehsan's desire for studying remains. After UNICEF launched the Myanmar curriculum last year, Ehsan participated in a private tutoring program as well as a learning center (UNICEF, 2023). Ehsan is one of the smartest students in his class, and he is now in grade 6, ready to graduate to grade 7. And up until 2022, the refugee camps in Kutupalong witnessed the enrollment of the initial 10,000 children, who are now receiving education following the national curriculum of their home country, Myanmar (UNICEF, 2022).

Humanitarian aid agencies have also been working on promoting inclusivity among the Rohingyas in Cox's Bazar through building user-friendly infrastructure to the disabled. For instance, 9-year-old Irfan has to rely on his brother to carry him to the bathroom everyday, otherwise he might trip and fall due to some body disabilities (UNICEF, 2022). This has become a great burden for Irfan. Luckily, UNICEF and partners have been responding to the needs of people living with disabilities in the camps, including children like Irfan. So far 1,000 disability friendly latrines have been constructed. This supports ease of use, whenever Irfan requires its services. "I am happy that I can use the new latrine by myself," says Irfan (UNICEF, 2022).

Food Insecurity and Malnutrition

Another identified problem in the camps in Cox's Bazar is food insecurity and malnutrition among refugees, especially children and women. A survey conducted in 2021, titled UNHCR SENS (Standardized Expanded Nutrition Survey), in

collaboration with the Bangladeshi government and the World Food Programme, revealed that the prevalence of low wasting (measured using Middle Upper Arm Circumference - MUAC criteria) was less than two percent among women of reproductive age, as well as pregnant and lactating women, indicating a significant decrease since 2017 (ReliefWeb, 2020). The report noted that younger children aged 6 to 23 months were more prone to malnutrition and anemia compared to older children aged 24 to 59 months. In addition, UNICEF indicates that the rate of acute malnutrition in the camps affects more than eleven percent of children, while over thirty percent of children suffer from chronic malnutrition (Jean, 2020).

Many NGO efforts have been put into addressing this issue as well, as some agencies seek to assist Rohingya refugees to improve their food security, achieve more dietary diversity, and strengthen their self-reliance. Some examples include the ESFL project implemented by the Helvetas Swiss Intercooperation - the programme has assisted 22,000 families with vegetable production (UNHCR, 2022). 7,000 of these families are in the host community, whereas 15,000 are in the Rohingya community. Through the Local Service Providers (LSPs) and the formed Service Provider Association (SPA), refugees and host communities have continued simple access to information and technical assistance. The existing Collection and Sales Centers and Farmer Group Markets in the Host Community can now sell a portion of their products to WFP (World Food Program) merchants. As a result, the Rohingya refugees would have increased access to fresh vegetables in the camps (2022).

The most evident and dangerous type of malnutrition prevalent among refugees is severe acute malnutrition (SAM), also recognized as severe wasting (UNICEF, 2021). This condition arises when a child's immune system weakens due to a lack of proper nutrition and recurrent infections like diarrhea. In 2021, UNICEF-supported clinics in Rohingya refugee camps provided treatment to 6,923 children under the age of five suffering from SAM, while 869 Rohingya children aged 6 to 59 months without underlying medical problems were admitted to UNICEF-supported comprehensive nutrition facilities. Among these cases was Nur Kayas, a 23-month-old boy, who was brought to the Integrated Nutrition Facility after battling severe diarrhea. Nutrition experts were able to

identify her severe acute malnutrition during the initial assessment and collaborated with her mother, Sajida, to formulate a nutrition plan that includes frequent monitoring and counseling to aid her recovery and well-being (2021).

Gender Based Violence and Inequality

Data gathered from 19 camps in Cox’s Bazar by the International Rescue Committee has revealed that 81 percent of gender-based violence (GBV) within the Rohingya camps is committed by intimate partners, with 56 percent of these incidents involving physical violence (Win, 2023). Women from Kutupalong refugee camp among the Rohingya community reported that religious leaders with ties to Arakan Rohingya Salvation Army (ARSA) leaders inside the camp often discourage women from pursuing employment outside the home. They also criticize fathers who permit their daughters to pursue education or work with non-governmental organizations (NGOs) and issue threats to women seeking divorce. Conservative factions of young people and men have begun to monitor women’s decision-making processes, imposing strict dress codes, such as the constant wearing of burqas, and questioning women’s presence in public and workplace environments (2023). These actions further limit the freedom of movement for women and girls.

An anonymous girl in the camp once said, “I have been beaten two times by Rohingya men with umbrellas while I am going to my workplace. Most of the time I feel afraid to go outside alone. Domestic violence also not a new issue here. Rohingya men assume that they need to show themselves to be manly by controlling their wife and beating them if the wife fails to fulfill the domestic task or fails to fulfill their will. The protection mechanism is not functioning well (2023).”

To address this issue, the International Organization for Migration (IOM) teams in Asia and the Pacific region have been implementing a range of programming focused on gender-based violence (GBV). IOM arranged a sequence of cultural gatherings featuring individuals with disabilities in the areas of Ukhiya, Teknaf, and Cox’s Bazar as part of their commemoration of the International Day of Persons with Disabilities. These events served as a platform to heighten awareness about the unique

risks of gender-based violence (GBV) that arise at the intersection of gender and disability (2021).

Furthermore, IOM has been taking steps to enhance accessibility for women and girls with mobility challenges by installing ramps in its Women and Girls Safe Spaces. These efforts ensure that these spaces remain accessible to all. Women and girls with disabilities have been a focal point in the distribution of dignity kits, as well as in initiatives aimed at promoting awareness about GBV, protection, and the risks associated with trafficking. The IOM released a story book titled “Stories from Rohingya Women and Girls,” which was showcased in eight IOM-led Women and Girls Safe Spaces (WGSS). This publication features the artwork and narratives crafted by Rohingya women and girls, reflecting their memories, emotions, aspirations, and dreams (2021).

The IMO also hosted a roundtable gathering that saw the participation of 30 representatives from various institutions, government bodies, and women working with different NGOs and INGOs in Cox’s Bazar. The purpose of this discussion was to address topics related to migrant women’s protection and socio-economic empowerment. The participants engaged in conversations about the challenges, opportunities, potential interventions, and solutions related to gender equality, violence prevention, migrant protection, and the socio-economic empowerment of women (2021).

In addition to IOM community outreach initiatives focused on addressing gender inequality, UN Women and the Bangladesh Police, with funding from the governments of Australia, Germany, and Japan, have established five relief centers for women and children in the camps over the past three years. These 24/7 help desks are manned by trained female police officers and offer a range of essential services to women and children facing violence. These services include medical care, psycho-social counseling, sexual and reproductive healthcare, and connections to other vital support services. An additional five help desks tailored for women and children are currently in the process of being established (2021).

Analysis

During the research process of examining how local initiatives and international organizations use different methods to address the problems of lack of education, food insecurity, and gender-based violence in the refugee camps of Cox's Bazar, I realized that these problems are interconnected and have a complex correlation. For instance, the lack of education can limit refugees' access to the information, opportunities, and skills they need to become economically self-sufficient and self-reliant. Thus, without education and employment prospects, refugees are more likely to experience food insecurity, as they may not be able to earn a living or access resources for their livelihoods. This could also exacerbate gender-based violence, as women may not know how to secure their rights and what resources they can access for support due to their limited education. Inadequate education can also lead to early marriage, which is often associated with a higher risk of domestic violence. If women and girls are often disproportionately affected by food insecurity in camps, they might face discrimination in access to food, making them more vulnerable to violence.

All three issues are exacerbated in refugee camps due to the overcrowded and resource-scarce environments, where the refugee population exceeds available resources and services. Addressing these interconnected issues requires a comprehensive approach that takes into account the complex web of factors. This may involve providing educational opportunities, livelihood support, and gender-sensitive programming to break the cycle of poverty and illiteracy, food insecurity, and gender-based violence. Additionally, strengthening the overall infrastructure and support systems in refugee camps is essential to mitigate these challenges.

Conclusion

There are a few reasons I chose to conduct a case study on a particular refugee camp. Firstly, I have previously completed a research project that interviewed staff members working at a local NGO based in Kenya, Action Africa Help International, to address challenges faced by women and children in the Kakuma Refugee camp (Kenya). I examined how this NGO taught skills to refugees in that camp,

and resulted in alleviating lives for the women and children. Secondly, I was inspired by the piece on the "Goma: A Total Ethical Disaster" that I read for the research practicum, which discusses the disagreement between the local government and humanitarian organizations in treating the cholera outbreak in the camp. The article also stressed the downsides of humanitarian aid that made the situation worse, and I believe that there should be more awareness of the different applications of humanitarian aid.

The Kutupalong Refugee Camp in Bangladesh was established after the Rohingya Crisis, and became one of the largest and most densely populated refugee camps in the world due to the influx of Rohingya refugees fleeing violence and persecution in Myanmar's Rakhine State. My research focuses on this refuge for those escaping religious persecution in Myanmar. Within the camp, three primary challenges have emerged: limited access to education and integration, hunger and malnourishment, and incidents of gender-based violence. Various local and international aid agencies are working together to address these issues, engaging with local communities, tackling underlying structural problems, and imparting knowledge to the refugees.

During my research, certain limitations arose. One significant constraint was the limited time available, preventing me from investigating another major issue within the camp: environmental concerns. This encompasses challenges such as deforestation, driven by the camp's rapid expansion for shelter construction and firewood, leading to soil erosion and biodiversity loss. Furthermore, the deforestation and steep terrain make the region susceptible to landslides during the monsoon season, endangering camp infrastructure and residents. Additionally, water source contamination and inadequate sanitation can result in waterborne diseases and river and stream pollution. In future research, I aim to delve deeper into how humanitarian organizations are addressing the environmental challenges and promoting sustainable practices within the camp. It is crucial for stakeholders to acknowledge the interconnected nature of these issues and allocate resources and attention equally to effectively tackle the humanitarian challenges in Kutupalong Camp.

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This past summer was very enriching for me. Thanks to this program and your guidance, not only was I able to write my own research article, but I also conducted an actual field research in Bangkok, Thailand, where I visited local humanitarian organizations working to address gender inequality and climate issues in Thailand. Through interviews and conversations with NGO organizers and community members, I was able to gain an understanding of the economic, social, and cultural challenges faced by marginalized women, children, and gender groups in Thailand. This trip was significant for me because it not only gave me the opportunity to explore the application of the concepts we talked about on a larger scale, but also showed me the heartwarming side that many people (or organizations) are working to address social inequalities to improve lives. It has also given me faith that one day I will be able to use the knowledge and skills I have gained in anthropology to serve the marginalized groups in this global community.

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The Effect of Music Training in Young Children

By Carolyn Foo

Author Bio

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Abstract

Music training, the active participation in learning music, can lead to changes in the brain's structure also known as brain plasticity. The impact of experiences that cause brain plasticity is especially strong during a child's developmental period. These changes in the brain due to music training can impact domains outside of music itself, suggesting a possible impact on a child's cognitive development. This literature review intends to determine whether there is evidence to support the idea that music training improves cognitive development. Through different literature, the effects of music training on the brain are shown from a measure of brain plasticity and near and far transfer effects. However, studies on this relationship do not consider external factors such as socioeconomic status, genetic predisposition, and reward value, that can impact the effect of music training in children. The findings reveal a possible positive correlation between music training in young children and improvement in cognitive development, but a causation relationship cannot be determined.

Keywords: Brain plasticity, critical periods, music and the brain, music training, genetic predisposition, cognitive development, transfer skills, education

Introduction

Learning skills are used in one's entire life. Whether it be in education, careers, or daily life, cognitive skills are important. Thus, when children are growing, cognitive skills (reasoning, logic, reading, etc.) are a critical set of milestones during that developmental period (Cognitive Development Domain, 2022). This developmental period where changes and influences of experience are strong, is known as the sensitive period (Miendlarewska & Trost, 2014; Harbin & Besson, 2009; Nelson et al., 2019).

Music training refers to the active participation in learning music. Music training is an experience that can lead to changes in brain structure (Herholz & Zatorre, 2012; Miendlarewska & Trost, 2014; Habib & Besson, 2009). These changes can impact domains outside of music itself, suggesting musical training has an impact on children's cognitive development and skills that will carry into their entire lives. (Hempenstall, 2019; Hyde et al., 2009; Miendlarewska & Trost, 2014).

Through a literature review, this paper explores the evidence supporting the idea that music training can improve cognitive development and lead to brain plasticity. First, the concept of brain plasticity is explored; second, the processing of music in the brain is identified; third, children who receive music training and those who do not receive music training are compared with the identification of factors not controlled for. Subsequently, music training in children on cognitive skills and development is reviewed.

Methodology

This literature review was conducted using Google Scholar, Jstor, and Google (for definitions). The restrictions for the search were no articles before the year 2000. The keywords used in these searches were "music and the brain", "brain plasticity", "effect of music training in young children", "musical training", and "critical periods". The analysis was performed through reading and studying the literature collectively to determine whether there was clear evidence for brain plasticity and cognitive effects due to music training in young children.

Discussion

Brain Plasticity

The nervous system, once thought of as static, changes as a result of experiences (Kolb et al., 2003). A major organ of the nervous system is the brain, which acts as a control system for the nervous system. Brain plasticity, also known as neural plasticity, is the ability of the brain and neurological system to change and reorganize in response to stimuli, which can either be internal or external factors.

The stimuli enact structural changes, reorganization of neural connections, and functions (Mateo-Aparicio & Rodriguez-Moreno, 2019). The two main mechanisms of brain plasticity are functional plasticity and structural plasticity (Puderbaugh, 2023). Structural plasticity is the physical structure of the brain changing due to stimuli, such as learning a musical instrument. Synaptic plasticity, for example, is the ability of neurons to change in strength and efficacy of neural connections in response to experience-dependent stimuli (Mateo-Aparicio & Rodriguez-Moreno, 2019). Functional plasticity occurs when the brain has functional changes, usually due to damaged areas in the brain (Puderbaugh, 2023). This typically arises in patients experiencing seizures resulting in long-term damage. Plasticity is important for the development and function of the brain (Mateo-Aparicio & Rodriguez-Moreno, 2019). In effect, brain plasticity affects learning, cognitive, and motor processes (Mateo-Aparicio & Rodriguez-Moreno, 2019). Thus, studying brain plasticity can show the effects of certain stimuli on the brain, how the brain develops, and how the brain is affected by damaged areas in the brain. This understanding aids the development of academic learning and therapies for patients recovering from brain injury, benefiting the education and healthcare systems (Mateo-Aparicio & Rodriguez-Moreno, 2019).

Music Processing in the Brain

The long-held view of music processing in the brain was that music is processed in one centralized area of the brain. However, the identification of neurological cases, such as brain damage caused by stroke, showed that a centralized location theory was not correct. This led to the development of the model of complex, interconnected

neural networks throughout the brain that process music. Thus, understanding how music is processed suggests that studying the effect of music training on young children is difficult.

Centralized Area for Music Processing

A popular view was that there was a single part of the brain just for music (Peretz, 2002; Warren, 2008). This idea was widely held because the isolation of musical abilities was evident in some pathological conditions (Peretz, 2002). However, many problems arose with this idea. Music is complex and multidimensional. It has dimensions of pitches, tempo (the speed), rhythm, and tone, making it unlikely that there is a center dedicated to music (Warren, 2008). Additionally, studies of clinical neurology reveal more evidence that this view is incorrect. One of these neurology studies is apperceptive music agnosia in the patient “JM” (Baird et al., 2014). Apperceptive music agnosia is a condition where selective music discrimination skills and the ability to identify familiar songs and environmental sounds are preserved (Warren, 2008; Baird et al., 2014). This disorder left a specific music function impaired while leaving other functions unaffected, suggesting that there is not a centralized music-processing area of the brain (Warren, 2008).

Complex and Whole Brain Music Processing

The improved model of music processing believes there are complex, interconnected neural networks throughout the brain involved in music processes (Warren, 2008; Peretz, 2002). Instead of one area of the brain dedicated to music, it is an entire brain experience. Different areas throughout the brain process different functions critical to music, like pitch, harmonies, tempo, and emotion (Warren, 2008). Processing music is modeled as a hierarchy organization with lower-status areas passing complex information up to higher-status areas (LaRivee, 2021). The organization makes the perception of music complex and interconnected.

Music Training in Young Children

Music training in early childhood has benefits in executive functions and brain plasticity. These benefits can be examined through studies comparing children who received musical training and education

and children who have not. Due to the critical and sensitive periods, periods where training has strong and lasting effects, learning music in childhood is effective. While the studies reveal improvement in many areas, there are external and internal factors that are not controlled for. As a result, a causation relationship cannot be determined.

Musically Trained versus Untrained Children

Music training is correlated with the improvement of skills related to music. For example, musically trained children have better performance in working memory and attention, both considered executive functions (Kausel et al., 2020). In this study, the researchers tasked two groups of children aged ten to thirteen (with music training and without music training) with bimodal (auditory and visual) stimuli and asked the participants to focus on the stimuli, either auditory, visual, or both, while their brain activity was observed using a function MRI (Kausel et al., 2020). After the assignment, they were tasked with a memory assessment of the stimuli (Kausel et al., 2020). The results revealed that musically trained children have better performance on memory retrieval tasks and increased activation of areas in the brain related to attention control during the initial learning of information (Kausel et al.).

Another study shows a similar improvement in cognition and non-verbal IQ in the group with musical training. In the study by Neville et al. (2008), the researchers separated children aged three to five into four groups, a small class (5:2 student-to-teacher ratio) with music education (creating music, listening to music, and singing), a small class with Head Start (typical preschool curriculum) curriculum, a large class (18:2 student to teacher ratio) with Head Start curriculum, and a small class with a curriculum focused on attention skills. The results of the study show that all groups except the large class size saw similar improvements in non-verbal IQ and spatial and numeracy cognition (Neville et al., 2008). While this study could suggest a correlation between music training and cognitive function and IQ, it is difficult to determine. Because all the small groups, including the music education group, show improvement in the same areas, it suggests that more attention to the children created this result. To determine a definitive effect of music training more research needs to be considered.

A final study shows a possible correlation between music training and motor and auditory functions. In the study by Hyde et al. (2009), a group of children with a mean age of 6.32 received instrumental music training for 15 months compared to the control group, children who did not receive the instrumental music training and received only a weekly forty-minute music class at school that consisted of singing and playing bells and drums. The results were obtained from magnetic resonance imaging (MRI) of the brains and behavioral assessments to test motor skills, listening skills, and music discrimination skills. It also tested five far-transfer skills (Hyde et al., 2009) which are skills related distantly to music, like skills in the verbal and visual domains. The results showed that the music training group had greater relative voxel size, a regional structural change, in areas of the brain related to motor and auditory functions similar to professional musicians (Hyde et al., 2009). This brain plasticity correlated with better performance on melodic and rhythmic tests (Hyde et al., 2009). Additionally, the experimental group showed more improvement in motor, listening, and music discrimination skills, but no significant improvements were made in far-transfer skills (Hyde et al., 2009).

These three studies show evidence that there is a possible correlation between music training and improvement of cognitive and executive skills, but there are limitations to these studies. Thus, a causation relationship cannot be determined.

Critical and Sensitive Periods

The effect of music training on younger children is often studied during critical and sensitive periods because these periods are important to brain plasticity and development. The critical period is a strict period where training alters performance and is essential for development, and the sensitive period is a time where training on the brain has strong effects (Miendlarewska & Trost, 2014; Harbin & Besson, 2009; Nelson et al., 2019).

While the critical and sensitive periods are similar in regards to the time music training has a strong impact on the brain, they differ in the time frame, flexibility, and changes made to the brain. The experiences during the critical period make permanent changes to brain function as the brain is

still developing (Nelson et al., 2019; Miendlarewska & Trost, 2014). Moreover, different brain regions and domains have different critical periods. For example, the visual cortex has a critical period that ends after a few months after birth, while the auditory cortex myelination has a critical period that ends at age four to five (Miendlarewska & Trost, 2014). Generally, the critical period ends after age seven (Harbin & Besson, 2009). In contrast, the experiences during critical periods cause changes and shape the connectivity patterns because the basic structure of brain neural circuits is developed (Miendlarewska & Trost, 2014; Nelson et al., 2019). The time frame of the sensitive periods is not defined merely by age but also by experience and environment (Miendlarewska & Trost, 2014).

Due to the presence of these periods, earlier-trained musicians have a better overall performance of their instruments than later-trained musicians (Harbin & Besson, 2009). Thus, age and environment become important when studying the impact of music on the cognitive development of younger children.

Other Factors Not Controlled For

Although there is much evidence of a positive correlation between music on cognitive skills, there are many factors that have not been controlled for to determine a causation relationship. The main three factors are genetic predisposition, socioeconomic status, and reward value.

Genetic Predisposition

Children with certain brain structure differences are more predisposed to become musicians and motivated to learn music (Miendlarewska & Trost, 2014; Hyde et al., 2009). Studies have associated certain music abilities, like music perception and music discrimination, with loci on chromosomes in the body which carry the genetic information for humans (Tan, 2014). Many studies do not randomly assign the participants to the experimental or control groups (Miendlarewska & Trost, 2014). Thus, the improvement in cognitive skills may not be only due to music training, but also due to innate musical abilities and differences in motivation. The distinction between innate and developed differences in the brain is difficult.

Socioeconomic Status

Families with higher socioeconomic status and higher education have a higher probability that their children get access to music education (Miendlarewska & Trost, 2014; Francisco Reyes, 2019). In 2012, the Department of Education's research showed schools that had a higher percentage of poverty had fewer music resources, teachers, and music courses (Francisco Reyes, 2019). Additionally, low socioeconomic status areas in New York City and Chicago lack music instrument stores, suggesting less access to music education (Francisco Reyes, 2019). Thus, controlling for this factor could eliminate the possibility of the difference in access to music education contributing to the results of studying music training in young children.

Reward Value

The motivation and the reward of learning music can affect how music will impact an individual. Dopamine is a hormone that is released by the brain, which gives people a sense of pleasure and motivation (Dopamine, 2022). So, if music learning is pleasurable for the musician, dopamine will be released causing more motivation to continue practicing. Moreover, dopamine plays an important role in long-term memory formation (Miendlarewska & Trost, 2014). Thus, a positive and rewarding experience could promote more training leading to brain plasticity (Miendlarewska & Trost, 2014; Dopamine, 2022). However, a stressful and negative experience creates a memory that associates music training with stress. It has also been shown that negative reward harms learning and memory and impairs performance (Miendlarewska & Trost, 2014). While controlling the reward and pleasure of music is difficult, discriminating between a stressful and positive music experience is beneficial for determining the impact of music training.

Music Training on Cognitive Development

The effect of music training on cognitive development can be measured and observed through transfer effects and brain plasticity. This development is important for education and learning.

Transfer Effects

Transfer effects are effects that are from training that results in cognitive development that leads to the enhancement of skills in areas outside of music (Hempenstall, 2019; Hyde et al., 2009; Miendlarewska & Trost, 2014). There are two main categories of transfer effects, near and far transfer.

Near-Transfer

Near transfers are skills closely related to music training (Hempenstall, 2019; Hyde et al., 2009; Miendlarewska & Trost, 2014). For example, listening and fine motor skills are considered near-transfer skills in music (Miendlarewska & Trost, 2014). There is much evidence of near transfer in the literature because there is a close resemblance between music skills and other close domains (Hyde et al., 2009).

Near-transfer can be observed in the studies performed by Kausel et al. and Hyde et al. In the Kausel et al. (2009) study, the children with music training saw improvements in attention control, a near-transfer skill. Similarly, in Hyde et al. (2009), the children who received music training showed more improvement in motor, listening, and music discrimination skills.

Far-Transfer

Far transfer skills are transferring skills from a music context to a dissimilar context (Hempenstall, 2009). For example, verbal memory, social skills, IQ, and reading skills are considered far-transfer effects of music (Miendlarewska & Trost, 2014). There is limited evidence of far-transfer skills because it is difficult to determine a resemblance between music training and far-transfer skills (Hyde et al., 2009). Far-transfer can be observed in Neville et al. (2008), where children with music training improved in non-verbal IQ and spatial and numeracy cognition. However, due to the inclusiveness of the study, far-transfer effects in this study cannot be determined as all small groups saw this improvement.

Brain Plasticity

Music training in young children causes structural brain plasticity. The years of training and age of commencement correlated with brain plasticity (Herholz & Zatorre, 2012; Miendlarewska & Trost, 2014; Habib & Besson, 2009). This is due to the critical and sensitive periods, showing that earlier commencement of training has a greater effect on the neural systems (Miendlarewska & Trost, 2014; Habib & Besson, 2009). In the studies mentioned above there was increased activation of areas of the brain in the fronto-parietal which is related to attention control during the initial learning of information (Kausel et al., 2020). Moreover, after 15 months, the group that received training had a greater relative voxel size in motor areas similar to plastic changes in professional musicians. (Hyde et al., 2009).

This evidence suggests that music training can induce brain plasticity (changes in brain structure and neural circuits) which has transfer effects. Studying brain plasticity and how it affects behavior, like cognitive skills, allows researchers to see the impact of music training.

Effect on Education and Learning

Due to brain plasticity and music training having both near and far transfer effects, music training could enhance other learning domains. For instance, Moreno et al. (2008) observed improvement in sensitivity to pitch changes and reading abilities of complex words in children with music training. The improvements in this study highlight both near (sensitivity to pitch changes) and far transfer effects (reading abilities). Moreover, a study that examined the relationship between music involvement and academic achievement showed that academic achievement positively correlated with music involvement in and outside of school (Southgate & Roscigno, 2009). The positive correlation between music training and involvement, and education reveals that music could help improve cognitive skills important for learning.

Conclusion

Music training in young children has been shown to benefit children in many ways. It has been associated with structural brain plasticity that changes how the brain functions and organizes certain processes. The brain plasticity changes are permanent when occurring in the critical period and particularly strong in the sensitive period. Moreover, transfer effects, both far and near, were observed in children who received music training. This result suggests improvements in cognitive development. This type of music involvement has also been associated with improvement in academic achievement in education. While there are clear benefits for music training in young children, a causation relationship cannot be determined due to important aspects of the experiments not being controlled. Some main factors are genetic predisposition, socioeconomic status, and reward. While many studies, like Hyde et al. (2009), Kausel et al. (2020), and Neville et al. (2008), control for socioeconomic status, they do not control for other factors like genetic predisposition and reward values as they are difficult to isolate. Thus, research methods still have room for improvement. If more variables in the studies can be controlled for in the future, researchers can determine a causation relationship. This relationship can help children improve cognitive abilities that will benefit them for a life full of learning.

While there is no clear evidence of a causation relationship between music training and cognitive development, the literature shows a benefit for music training in young children. In the studies that were explored, there is a generally positive result when children receive music training. There is often brain plasticity and both near and far transfer effects. Therefore, music training for young children could be implemented in schools and education to improve student's learning experience. Additionally, music is associated with enjoyment and engages the entire brain. By adding a course or music experience in a child's during their education they could benefit from both the positive impacts of music itself and learning abilities.

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A Review of Inducing Chromosomal Instability in Cancer Therapy

By Isabella Hu

Author Bio

Isabella Hu is a junior at Belmont High School in MA, USA. She's always held an interest in the STEM field, from physics to math, enjoying them all. A cancer biology course this past summer inspired her to research this field where she took particular interest in looking at a relatively newer area of cancer therapy. Aside from cancer biology, she loves her current economics class and listening to music!

Abstract

Chromosomal instability (CIN) is one of the enabling hallmarks of cancer. There are a multitude of targets for CIN including but not limited to: spindle assembly checkpoint (SAC), anaphase-promoting complex (APC), and mitotic checkpoint complex (MCC) genes. In this review we will be focusing on CIN-inducing therapies. Some of the enduring problems faced with cancer are metastatic tumor growth and resistance to gold-standard treatments such as chemotherapy. CIN-inducing therapy reduces tumor adaptability by triggering apoptosis of tumor cells with high levels of CIN, halting tumor growth, and increasing the efficacy of other chemotherapies and radiation treatments. One of the most common strategies was inhibition of Mps1, a gene important for the MCC and responsible for maintaining accurate chromosome segregation. Inhibition of this gene led to mitotic catastrophe, chromosome missegregation, aneuploidy, and ultimately cell death. Synthetic lethality was another strategy commonly used for CIN, where two mutations were utilized to induce lethal CIN. Cancer cells with specific mutations in genes such as Polo-kinase 1 and BRCA1/2 ultimately undergo apoptosis. Thus, chromosomal instability is a viable therapeutic target both for improving current treatments and for development as treatment on its own.

Keywords: Chromosomal Instability, Inducing CIN, Cancer Therapy, Mps1 Inhibitors, Synthetic Lethality, Treatment sensitizing, Paclitaxel, Docetaxel

Introduction

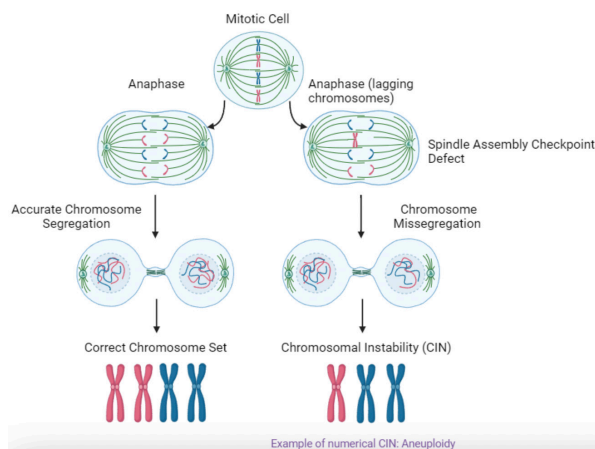


Figure 1: Chromosomal instability, spindle assembly checkpoint, mitosis

Cancer is a prevalent issue today. In 2020, there were around 18 million new cases of cancer, 10 million of which ended in death (World Health Organization, 2022). It is one of the leading causes of death around the world, rendering treatment for cancer a high-priority concern.

Characterized by its uncontrollable proliferation of cells, once left unchecked, cancerous cells can spread to various parts of the body forming lethal metastatic tumors. Chromosomal instability (CIN) is one of the enabling hallmarks of cancer. It refers to the errors that occur during chromosome segregation leading to a loss or gain of chromosomes, and sometimes aneuploidy. To maintain chromosome segregation fidelity in mitosis, cohesion must be maintained during the G2 and M phases, and precisely timed destruction of the sister chromatid cohesion must occur. These activities are regulated by cyclin-dependent kinases and the spindle assembly checkpoint (SAC). Different alterations in the various mitotic mechanisms involved, such as cohesion defects can lead to chromosomal instability (Thompson et al., 2010). Another mechanism of CIN is by mutations of SAC genes. The SAC sends signals from kinetochores to stall anaphase until all chromosomes form proper bipolar attachments to spindle microtubules, once they are properly bound the signaling switches off liberating the anaphase-promoting complex (APC). The error-correction pathway reactivates SAC signaling if a wrongly attached chromosome is found and detached.

A kinase central to this process is Mps1/TTK (referred to as Mps1 in this review) which is needed for both error correction and SAC. It is responsible for a variety of tasks including promoting the attachment of kinetochores to microtubules by regulating Aurora B activity, localizing to kinetochores, and causing events that lead to SAC activation. Mps1 also impacts APC binding and the stability of the mitotic checkpoint complex (MCC).

The SAC, error-correction pathway, and MCC are complex, meaning various impairments can lead to CIN (Pachis et al., 2018). There are two types of CIN: numerical CIN, which refers to aneuploidy and gene copy number alterations, and structural CIN, which can cause specific gene amplifications, deletions, and transformations (i.e. DNA double-strand breakage). CIN may trigger apoptosis due to how unstable the cell is or because of mitotic catastrophe. CIN-inducing therapies aim to create a high level of CIN to trigger cell death, creating a barrier to tumor growth. One of the therapies discussed in this paper is synthetic lethality. Synthetic lethality (SL) refers to the genetic or chemical combined alteration of otherwise individually viable gene pairs to target usually ‘non-druggable’ targets. Through genetic and chemical screening, a target gene is chosen and the interaction between the target gene and the altered gene creates synthetic lethality. When exploring synthetic lethality, scientists must consider drug toxicity, efficacy in different body regions, penetrance, initiation, and maintenance of the drug (Setton et al., 2021). In current research, mitotic genes were often targeted to explore therapy options. This literature review’s aim is to highlight some of the methods CIN can be used in therapy to slow or halt tumor progression. In this review, we will discuss some of the different methods of inducing CIN and how they are exploited in treatment.

Methodology

PubMed was used to source all papers reviewed. The keywords used were formatted as follows: “chromosomal instability” cancer therapy. The filters “Last Ten Years” and “Free Full Text” were applied to focus on current CIN therapy developments. As of August 29th, 2023, the last day of looking through papers on PubMed, 341 results appeared and 24 were used in the results of this review. Literature

reviews were excluded from the results of this review. Papers focused specifically on inducing chromosomal instability were chosen.

Results

Table 1. Papers that discussed CIN-exploiting therapy divided by method

Method of Therapy	Author
Mps 1 Inhibition	Faisal, A., Mak, G. W. Y., Gurden, M. D. et al., 2017
	Stratford, J. K., Yan, F., Hill, R. et al., 2017
	Szymiczek, A., Carbone, M., Pastorino, S. et al., 2017
	Martinez, R., Blasina, A., Hallin, J. F. et al., 2015
	Libouban, M. A., de Roos, J. A., Uitdehaag, J. C. et al., 2017
	Choi, M., Min, Y. H., Pyo, J., et al., 2017
	Cunningham, C. E., Li, S., Vizeacoumar, F. S., et al., 2016
Synthetic Lethality	Goff, L. W., Azad, N. S., Stein, S. et al
	Dolly, S. O., Gurden, M. D., Drosopoulos, K. et al
	Nieminszczy, J., Broderick, R., Bellani, M. A., Gagos, S., & Seidman, M. M., 2019
	Xu, H., Antonio, M. di, Mckinney, S. et al., 2017
	Li, J., Ohmura, S., Marchetto, A., et al., 2021
	Sajesh, B. v, Bailey, M., Lichtensztejn, Z., et al., 2013
Treatment Sensitizing	Bai, H., Xia, S., Zhu, L. et al., 2022
	Chinn, D. C., Holland, W. S., & Mack, P. C., 2014
	Bakhoun, S. F., Kabeche, L., Wood, M. D. et al., 2020
	Maia, A. R. R., Linder, S., Song, J. Y. et al., 2018
	Scribano, C. M., Wan, J., Esbona, K. et al., 2021
	Vargas-Rondón, N., Pérez-Mora, E., Villegas, V. E., et al., 2020
	Other Methods
Petrov, N., Lee, H.-S., Liskovych, M., et al., 2021	
Oku, Y., Tareyanagi, C., Takaya, S., et al., 2014	
Liu, X., Dong, C., Ma, S., et al., 2020	
Ferrara, M., Sessa, G., Fiore, M. et al., 2017	

Mps1 Inhibition

The Mps1 gene, also referred to as the TTK gene, plays an important role in the chromosome alignment at the centromere during mitosis and is required for centrosome duplication. It is a critical mitotic checkpoint protein for maintaining the integrity of chromosome segregation during mitosis. Mps1 inhibitors can be applied to various cancers when inducing CIN to trigger apoptosis. TC Mps1 12 increased misaligned and lagging chromosomes in mitotic cells as well as induced premature mitotic exit in hepatocellular carcinoma cells. The induced chromosome missegregation led to CIN. Using PARP-1 as an indicator of apoptosis, it was found that HepG2 and Hep3B cells treated with TC Mps1 12 showed significant cleavage of PARP-1 suggesting

that chromosomal instability and centrosome abnormality might lead to mitotic catastrophe (Choi et al., 2017). Martinez R et al. (2015) applied Mps1 inhibition to triple-negative breast cancer, inducing knockdown by doxycycline. This knockdown led to a dose-dependent reduction in cell viability of the HCC1806 TNBC tumor cell line, and, similar to TC Mps1 12, caused chromosome missegregation and eventual apoptosis in rapidly dividing proliferative gastrointestinal compartments. Several Mps1 inhibitors were used for knockdown including MPI-047960, PF-7006, and PF-3837. Faisal et al. (2017) provided a characterization of the oral Mps1 inhibitor CCT271850. It focused more on the spindle assembly checkpoint (SAC) function which regulates accurate chromosomal segregation by delaying anaphase until all chromosomes are properly to the spindle poles. They observed SAC abrogation resulting in a large percentage of mitotic cells with unaligned chromosomes, which then led to aneuploidy. Using PARP cleavage, they concluded that apoptotic cell death induced by CCT271850 was mediated by Mps1 inhibition. Mps1 inhibition as treatment proved to be versatile as it was shown to be effective in pancreatic cancer and malignant mesothelioma, and could be administered orally, as a small-molecule inhibitor, and through siRNA-mediated depletion (Stratford et al., 2017; Szymiczek et al., 2017; Cunningham et al., 2016). Only one study discussed the effectiveness of Mps1 inhibitors based on cell type and CIN level (Libouban et al., 2017). After testing with colorectal carcinoma, adenocarcinoma, glioblastoma, osteosarcoma, and ovarian cancer cells using NTRC 0066-0, a selective and sub-nanomolar potent inhibitor, Libouban et al. found Mps 1 inhibition was more effective in aneuploid cells with no CIN phenotype.

Synthetic Lethality

As described in the introduction, synthetic lethality is the lethal combination of two independently viable mutations. In this review, cases where SL is used to induce CIN are looked at. Cunningham et al. (2016) examined the combination of protein phosphatase 2A (PP2A) inhibition and Polo-like kinase 1 (PLK1) overexpression in various types of cancer cells including breast, prostate, pancreatic, ovarian, and glioblastoma. Interactions of PP2A with mitotic regulators including PLK1 play a role in spindle pole separation and the mitotic checkpoint. When PLK1-overexpressing cells were treated with PP2A

inhibitors, mitotic defects, and DNA damage stress were exacerbated. The slight increase in the level of γ -H2AX protein within 24 hours after cantharidin treatment in PLK1-overexpressing cells suggested an impaired DNA damage response. Cunningham et al. (2016) found that levels of anti-apoptotic proteins Mcl-1 and Bcl-2 were significantly reduced, signaling the possibility of apoptosis in cells with PP2A inhibition and a high level of PLK1. Another way the PLK1 was utilized was through its depletion synergistically working with high PRC1 (Protein Regulator 1) expression which was able to repress chemo-resistant Ewing Sarcoma cells by inducing CIN and mitotic catastrophe (Li et al., 2021). Another synthetic lethal combination involved the candidate gene, GAK, which played a role in mainly mitotic spindle assembly and chromosomal alignment. The silencing of this gene was combined with F-box and WD40 repeat domain-containing 7 (FBXW7) deficiency in tumor cells. (FBXW7 is an E3 ubiquitin ligase whose frequent loss of tumor suppressor function leads to increased cellular proliferation and pro-survival pathways, cell cycle deregulation, chromosomal instability, and altered metabolism).

Through an RNAi screen, it was found that GAK, with all 8 individual siRNAs, when combined with FBXW7 depletion in parental HCT116 cells led to a statistically significant increase in cell death. Further testing revealed there was an increase in cleaved PARP levels in the FBXW7 deficient but not wild-type cells with GAK protein knockdown following RNAi. PARP cleavage was used to identify whether the cells were undergoing apoptosis following GAK RNAi. This data confirmed GAK-mediated apoptosis preferentially in the FBXW7 deficient HCT116 cells as compared with wild-type cells. Following GAK RNAi, there was also a clear induction in multipolar mitosis in the cell lines, the FBXW7 cells demonstrating a two-fold increase in tri- and multipolar spindles as well as a more severe version of this phenotype compared to wild-type cells. This suggested the combination of depletion of GAK and FBXW7 induced further CIN (Dolly et al., 2017). The synthetic lethality approaches with CIN targets discussed in the other papers included: targeting superoxide dismutase 1 (SOD1) through ammonium tetrathiomolybdate (ATTM) and 2-methoxyestradiol (2ME2) treatment in RAD54B deficient colorectal cancer cells to induce apoptosis, a combined depletion of BRCA1/2 and EXD2 to create an accumulation of broken replication forks to drive

mitotic catastrophe and cell death, and exploiting the BRCA1/2 deficiency with the small molecule drug CX-5461 to induce chromosomal breaks and structural abnormalities (Sajesh et al., 2013; Nieminuszczy et al., 2019; Xu et al., 2017). Alisertib, used to inhibit Aurora Kinase A, combined with mFOLFOZ, a combination of chemo drugs, led to similar results of aneuploidy and cell death (Goff et al., 2018). Synthetic lethality allows researchers to take advantage of previously existing mutations, such as the common deficiency of BRCA1/2, in cancer cells, and exploit them to exacerbate pre-existing CIN in the cancer cells to halt tumor growth.

Treatment Sensitizing

The most common drugs involved with inducing chromosomal instability in this paper were paclitaxel and docetaxel, both being taxane drugs. Breast cancer cell lines with intermediate CIN were found to be sensitive to taxane treatment and anthracyclines (Vargas-Rondon et al., 2020). Scribano et al. (2021) found similar results in breast cancer cells where increasing multipolar divisions in paclitaxel resulted in higher cytotoxicity and pre-existing chromosomal instability increased sensitivity for paclitaxel in breast cancer cells. More specifically, by genetically introducing centrosome amplification using tetracycline-inducible overexpression of Polo-like kinase 4 (PLK4), the number of multipolar spindles before and after anaphase increased, as well as the death of cells treated by paclitaxel. Interestingly, Mps1 inhibition also played a role in sensitizing cancer cells. It enhanced sensitivity to radiotherapy and enhanced chromosomal instability increasing the cell line's sensitivity to microtubule-targeting drugs such as vincristine or paclitaxel (Canovas et al., 2018). Canovas et al. (2018) also found when p38a inhibition was paired with either paclitaxel or docetaxel, the levels of cell death were increased, proving that the combination of p38a inhibition with taxane-based chemotherapy increased missegregation, DNA damage, and aneuploidy in cancer cells. This all led to tumor regression. Another Mps1 inhibitor, Cpd5, increased the sensitivity KBIP-B11 cells had to paclitaxel, as well as speeding up the mitotic arrest.

The combination of paclitaxel and Cpd-5 induced severe aneuploidy and resulted in more cell death after 48 and 72 hours of drug treatment. The two drugs gave rise to more segregation defects

due to an increase in cell divisions with multipolar spindles, leading to a higher level of apoptosis (Maia et al., 2018). Docetaxel treatment efficacy, on the other hand, increased when cells were concurrently exposed to MK-5108, an Aurora Kinase A inhibitor. In 10 out of the 11 cell lines, Chinn et al. (2014) tested, concurrent application of docetaxel and MK-5108 resulted in greater sustained growth inhibition. Aside from taxane drugs, etoposide, a drug that induces DNA damage, was also discussed. In salivary adenoid cystic carcinoma, the gold-standard treatment was usually radiotherapy or surgical resection, both of which still led to local, recurring metastasis. To combat this, Bai et al. (2022) found a synthetically lethal treatment of etoposide and suppressed polymerase theta (POLQ) that demonstrated greater efficacy in halting tumor growth compared to etoposide alone. Bakhom et al. (2015) also showed the role of CIN in radiation treatment. They found that GFP-Kif2b overexpression, suppressing numerical CIN, showed an increase in resistance to radiation treatment, likely due to cell death resultant being suppressed as a byproduct. Consequently, in a patient cohort with increased chromosome missegregation rates in mitosis, ionizing radiation had greater potency, notably with a decreased repair efficiency of double-strand breakages.

Other Methods

Various other ways of inducing CIN to slow or halt tumor growth were presented as well. Sometimes, knockdown of PLK1 or depletion of Citron Kinase (CIT-K) was enough to initiate cell, or cytokinesis failure for the latter. Both of these methods were successfully applied in colorectal cancer cells. Oku et al. (2014) investigated small molecule inhibitors that cause mitotic chromosome segregation errors, narrowing down to Rho-associated coiled-coil kinase (ROCK), whose inhibition induced centrosome fragmentation and apoptosis in T Leukemia cells. Drugs were another viable option for inducing CIN. SM15, a cytotoxic analog, inhibited the correction of erroneous attachments of polar spindles giving rise to cell death by mitotic catastrophe and apoptotic cell death from interphase (Ferrara et al., 2017). Pt-tpy, Pt-vpym, and Pt-cpym were also drugs that induced CIN, however, instead they induced telomere aberrations which were an important dysfunction leading to CIN. Inducing chromosomal instability and cell cycle arrest through miRNA was another method discussed, specifically on how to deliver this miRNA to the site

of action (Liu et al., 2020). Having these various methods to induce CIN and eventually lead to cell death provides researchers with many paths to explore to mitigate tumor growth and limit tumor adaptability.

Conclusion

CIN has great potential as a therapeutic target. In this review, it was found that inhibitors of CIN genes exacerbated the state of CIN in the cell lines which gave rise to apoptosis. Inducement of CIN was also commonly used with another treatment or drug, oftentimes it was the higher level of CIN that increased the treatment or drug's efficacy. The results of the studies are promising however several questions arise from a lack of current research. (1) What determines the level of CIN that a cell can survive? (2) How can we determine when that level no longer contributes to tumor adaptability but becomes lethal? (3) How can we account for these specific differences between cell and tumor types? (4) How can we determine which mechanism/pathway of CIN to target? Is there a need to identify one that can be applied to multiple cancers, or should our focus continue to be split over various targets? CIN-exploiting therapies have proven to be helpful in drug-resistant cancer developments and it remains important to continue exploiting that weakness in cancers. By continuing to approach treatments with a mindset open to combining therapies, doctors, scientists, and researchers can improve the lives and outcomes of cancer patients.

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Specified Treatments for Common Breast Cancer Cases Containing a p53 Mutation Review

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Abstract

With breast cancer being one of the most common causes of death, many researchers have looked into mutations that commonly appear and how they could affect the treatment a patient decides to receive. Mutations in gene TP53 are present in over one third of breast cancer cases, so it is a frequent mutation that is carefully researched and examined. This study aims to review how a mutation in p53 gene in breast cancer patients can influence the form of treatment. Elimination and reviewing of open-source papers, resulted in constant keywords added to the search for specified treatments in modern-day medical technology that have been used or will be in the future. COTI-2 and APR-246 are the compounds that at the time this research was most recently completed, in 2023, have been undergoing clinical trial to be used on patients showing this mutation. Although there have been published papers on this mutation for decades, there is yet to be enough research completed to know whether or not these compounds will positively or negatively impact the process of p53 mutation present treatment plans.

Keywords: Cancer, p53, Mutation, Breast+cancer, COTI-2, APR-246, Treatment, TP53, Female

Introduction

In the United States, breast cancer is the second leading cause of cancer death (Breast Cancer Statistics, 2022). Per every 100,000 women, about 380 are diagnosed with breast cancer and 125 pass away from the disease based on data gathered from 2016-2020 (USCS Data Visualizations, 2023). Triple-Negative Breast Cancers (TNBC) are around 10-15% of all breast cancer cases (American Cancer Society, 2023b); this subtype appears when a patient does not express the three hormone receptors: not containing estrogen or progesterone receptors and make minimal or an over exceeding amount of the HER2 protein, or the human epidermal growth factor receptor 2 (American Cancer Society, 2023a). Tending to spread and grow faster, this breast cancer has been found to have a mutation in gene TP53 in 80% of all cases, even though p53 is only mutated in 30-35% of total breast cancer cases (Duffy et al., 2018). Gene TP53 encodes for protein p53, and its role in the human body is to suppress and stop tumor growth or formation when the cell undergoes cell division (Information (US), 1998).

As a vital protein to prevent cancer formation, it is referenced to as the Guardian of the Genome (Lane, 1992), and it protects the integrity of DNA in the cell (Borrero & El-Deiry, 2021). The activated tumor suppressor protein promotes cell cycle arrest when damage in the DNA is prevalent and induces apoptosis or DNA repair (Ozaki & Nakagawara, 2011). Due to the importance of TP53's function, when mutated, the altered DNA goes undetected, and all genes that are initiated by p53 result in malfunction: DNA damage repair pathways, apoptosis regulation, and cell cycle arrest (Kaur et al., 2018). The multiple treatments for breast cancer, including p53 mutated cases, consist of chemotherapy, radiation, surgery, targeted drug therapy, among others (American Cancer Society, 2023a), but for mutations in p53, specific target drug compounds are constantly undergoing clinical trials to be used in the medical fields for mostly TNBC cases (Duffy et al., 2017). Reactivation of gene TP53 is a commonly targeted gene when treating breast cancer, for when p53 is not functioning properly, the damaged cell will continuously divide amidst going undetected by tumor suppressors (Synnott et al., 2018). The objective of this literature review is to review studies done on whether a mutation in female breast cancer patients in p53 can help determine which type of treatment to use.

Methodology

To write this literature review, it was selected only from recent open source papers published in the last 10 years (2013-2023). The search was carried out using the PubMed database (pubmed.gov) and consisted of the key words “breast+cancer treatments mutations”. Thousands of papers came up on the research that was later refined with additional new key words “p53 therapy female”. The papers found were narrowed down to around 100 papers. All of them were read, analyzed and separated into papers that were inside the scope of the research or not. There were limited papers regarding p53 mutations in breast cancer and their relation to treatments for female patients, but molecules APR-246 and COTI-2 consistently appeared in many papers. To follow up on those new keywords, papers about the two molecules when appearing in breast cancer led to a total of 25 open source papers published in the past ten years (2013-2023) to be selected. After the selection, the final number of papers used for the results of this review was 14 published papers.

Results

3.1 Mutant p53 as a Therapeutic Target in Breast Cancer Treatment and Therapy

According to Silwal-Pandit et al. (2017) in their study of a cohort of 1420 TP53 mutation samples as a prognostic or predictive tool in breast cancer treatment, the results showed that it is subtype-specific for that mutation to be prognostic. At the time the study was completed, they concluded that the predictive value of the mutation was still debated. They showed through the research that the TP53 mutations in breast cancer can result in a LOF (loss-of-function), GOF (gain-of-function), or LOH (loss-of heterozygosity) (Silwal-Pandit et al., 2017).

According to Duffy et al. (2017), their first study to see if p53 mutations in breast and ovarian cancer cases could be a target for new treatments showed that the methylated form of PRIMA-1 (APR-246) and COTI-2 are just some of the compounds that can reactivate a mutated p53 by converting it to have wild-type properties. In the existing preclinical models, it was proven that they demonstrate anticancer

activity in p53. As of 2017, the two compounds undergoing clinical trials were the APR-246 and COTI-2 compounds as mentioned above. When this study was completed, only APR-246 was used on patients during the trial with advanced serous ovarian cancer, and COTI-2 was in a phase behind in the clinical trial, used on patients with advanced gynecological cancer. Neither have been officially proved to be a useful treatment to human cancer in general (Duffy et al., 2017).

3.2 Mutations in p53 and Their Responses to Different Therapies

In Shahbandi et al. (2020), and their review of studies with different concluding results regarding p53 mutations in breast cancer and its responses to treatments, the review shows how each patient used in the studies had a specific form of treatment that had a more negative or positive effect on the results. From their prior knowledge knowing that each patient has a treatment regimen according to their physician, the studies are all a combined representation of the data, when in truth it is shown to not depict each subtype. There were also many cases where certain patients would receive a treatment others didn't, which resulted in an inaccurate study completed as there is no constant for everyone with different mutations of p53 (Shahbandi et al., 2020).

According to Bertheau et al. (2013), their study of p53 in breast cancer subtypes' responses to chemotherapy showed that their new insights into p53 would relate only to that specific type of chemotherapy. In their study, they took many different TP53 tumors and measured their responses to the different chemotherapies, many not showing a complete response at all. Using the information that mutations in p53 occur in 30% of breast cancer cases, with a high 80% in triple-negative breast cancer cases as well, they worked to see if it would make p53 a helpful biomarker for breast cancer management, in particular chemotherapy treatment plans. Their study showed that wild-type TP53 is found to be often resistant to chemotherapy (minimal/lack of response) while TP53 mutated non-inflammatory locally advanced breast cancers had over 50% of complete response. In the end of their study, they concluded that it would be necessary to continue more research to show from findings if TP53 would be a beneficial

biomarker (Bertheau et al., 2013).

3.3 Possible Treatments for Mutations in p53

According to Zatloukalova et al. (2018), the study done on all the researchers knew on PRIMA-1 and COTI-2, importantly shows how COTI-2 is still undergoing clinical trials to be used on breast cancer patients. PRIMA-1's methylated form is APR-246 and is known to be able to reactivate p53 when mutated. Not much was discovered regarding PRIMA-1 and COTI-2, but COTI-2 was found to be capable of inducing apoptosis in the cell (Zatloukalová et al., 2018).

According to Kaur et al. (2018), their study of mutations in p53's role in breast cancer therapeutic strategies, they showed that TP53 is a tumor suppressor gene that has been found to be mutated in breast cancer along with other forms of cancer. Due to this mutation, it results in the malfunctioning of the DNA damage repair, apoptosis, cell-cycle arrest, and more. So researchers have been focusing on therapeutic strategies for the mutations in p53 and have used many molecules to target the treatment of TP53. Many of these molecules have not yet reached the clinical trial stage except for APR-246 and COTI-2 (Kaur et al., 2018).

According to Duffy et al. (2018), in their study of having the common mutation of p53 be a biomarker or therapeutic target for breast cancer treatment, they found that there was not enough study done to confirm if it could be identifiable as a biomarker. What they did find was that APR-246, COTI-2 and other molecules are possible treatment options for patients with that mutation from the disease. "TP53 (p53) is the most frequently mutated gene in invasive breast cancer. Although mutated in 30–35% of all cases, p53 is mutated in approximately 80% of triple-negative (TN) tumors (i.e., tumors negative for ER, PR, and HER2)" (Duffy et al., 2018).

3.4 COTI-2 as Target Treatment for p53 Mutations

According to Synnott et al. (2019), in their study to see if future researchers could use COTI-2 as a possible target treatment for mutations in p53 in breast cancer cases, went through the process of creating an MTT array of 18 breast cell lines. Through immunofluorescent staining, specific antibodies for p53 were used to determine the binding to COTI-2 in those cells to then measure the apoptosis afterwards. The results determined that triple-negative breast cancers were more responsive to the treatment and also induced apoptosis, so the researchers determined that using COTI-2 as a target treatment for p53 mutations would not only be possible but also an effective approach for treatments (Synnott et al., 2020).

According to Tang et al. (2023), in their recent study on COTI-2's ability as a reactivator drug, they took the protein from COTI-2 treated cells and through western blot analysis, they were able to look closely into the results of COTI-2. Mutations in p53 have been found from previous studies to enhance MYC stability, so a reactivation in p53 would give it wild-type functions and destabilize MYC. Through tests, they proved that statement to be true, by using p53 activator, COTI-2, and destabilization in MYC occurred in each of the five cell lines containing mutated p53 used in the research. Analysis on the data showed that the COTI-2 has no effect on MYC degradation on the wild-type p53 cell line (Tang et al., 2023).

3.5 APR-246 as Target Treatment for p53 Mutations

According to Synnott et al. (2018), in their study of using RNA-sequence analysis to follow the effects on breast cancer cell lines after APR-246 was tested on the gene expressions. Nine breast cell lines were used and each response to APR-246 in the mutated p53 cell was recorded. The APR-246 at the time of publication was at stage 2 of the clinical trial, and during this, the researchers found the newly-developed molecule binds covalently to thiol groups in the mutated p53. This allowed for APR-246 to be a target treatment, as it reactivates tumor suppressor gene p53 and induces apoptosis. Not only has this study demonstrated the accurate targeting of the

mutated protein, but also could independently mediate anti-cancer activity no matter the state of TP53's mutated status (Synnott et al., 2018).

Conclusion

Mutations in p53 are common in breast cancer female patients, and as the results show, there is yet to be a type of treatment that induces apoptosis in every case. Compounds such as APR-246 and COTI-2 are constantly being retested and are undergoing multiple clinical trials to someday be used on real patients. But all papers have concluded that there is not enough data displayed to confidently state that the on mutation in p53 will determine the treatment. There have been thousands of papers published regarding p53 mutations in breast cancer, but limited amounts on specific treatments and their relation to each mutation. In the future years, many groups of researchers are going to continue to show their results in a yearly matter for the progress on most-tested molecule compounds, APR-246 and COTI-2.

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Reciprocity Between Music and the Emotional State

By Karen Wang

Author Bio

Karen Wang is a senior at Phillips Academy in Andover, Massachusetts. She has played piano and violin from a young age, and music remains a core part of her life today, as she currently plays in orchestra and chamber music groups at school. Her interests include computer science and biochemistry, and she hopes to integrate the arts, specifically music, into those fields through interdisciplinary research.

Abstract

Music and the emotional state are two concepts that are commonly associated with each other, and many studies have been conducted about their relationship. Some have discovered how listening to music activates parts of the brain that control the emotional state, such as the limbic system. Others have explored how the emotional state may influence the music that someone chooses to listen to. As a literature review, this paper takes studies from those areas to highlight the reciprocal relationship between music and the emotional state. This paper presents findings on the physiological mechanisms of music-evoked emotions, as well as how music serves as a self-regulatory tool for emotions. These findings provide greater clarity about the connection between music and emotions, which can help lead to more effective forms of behavioral management and music therapy. Future research can look more specifically into how one emotion is related to music listening, or how one genre of music is related to the emotional state.

Keywords: Music, emotions, music-evoked emotions, music therapy, physiology of emotions, regulating emotions

Introduction

People interact with music every day, whether it is intentionally played on the radio or played in the background of a store. It is common to encounter people having an emotional response to music, and it is also ordinary for people to listen to music that reflects their own emotional state. When listening to music, the brain receives auditory information that influences the emotional state. Music expresses emotions through various amalgamations of musical features, such as tempo and loudness, and the listener has their own perception of the music-expressed emotion. In addition, music induces emotions, as music activates parts of the brain that regulate and control emotions, such as the amygdala and the hippocampus. Listening to music affects the endocrine and autonomic nervous systems as well, leading to hormonal and physiological changes. On the other hand, the listener's emotional state affects their choice of music due to self-regulatory goals. Music can fulfill various self-regulatory strategies and serve self-regulatory functions, and personal preference and association is especially important in the process of choosing music.

This literature review serves to explore the relationship between music and the emotional state and discuss the reciprocity between these two elements. Published literature was used for the discussion, and keywords such as, "music-evoked emotions," "physiology," "music and the brain," and "selecting music" were searched on Google Scholar, JSTOR, and ProQuest. Articles were sourced from scientific journals such as *Journal of New Music Research*, *Psychology of Music*, and *Frontiers in Neuroscience*.

Discussion

Definitions and Fundamental Physiology

The relationship between music and the affective state is a complex one. To understand this relationship, multiple terms must be defined. Firstly, Longe (2022) defines emotions as a physiological response to external stimuli. An emotional response is dependent on personal experiences, cognitive appraisal, and subsequent behavior (Longe, 2022; Van den Tol & Edwards, 2011). Feelings are an aspect of emotion (Scherer, 2004), as they are the conscious

awareness of emotions (Herbert et al., 2011). While emotions and feelings are closely related, emotions primarily describe physiological changes, while feelings are the mental experience of emotions. Finally, affect is a general term covering both emotion and mood, and moods are less intense than emotions and tend to last longer (Van den Tol & Edwards, 2011). All these psychological and physical changes ultimately serve to regulate and maintain homeostasis and to allow the body to respond appropriately to external disruptions (Scherer, 2004; Habibi & Damasio, 2014).

Physiology of Emotions

Emotion activity in the brain involves many parts of the limbic system, which is a collection of nerves and structures located near the cerebral cortex that control emotions and behavior (Longe, 2022). One of these structures is the amygdala, which is in the medial parts of the temporal lobe and plays a key role in controlling the status of emotions ("human nervous system"; Koelsch, 2014). PET (Positron emission tomography) studies, which reveal glucose metabolism during memory encoding, show that the amygdala helps with forming long-term emotional memories (Dalgleish, 2004). Also in the temporal lobe, the hippocampus plays a major role in emotional processing by consolidating long-term memory (Hale, 2020). It interacts with the amygdala in a strong two-way relationship, increasing the plasticity of these two structures and supporting long-term emotional storage. (Schaefer, 2017; Koelsch et al., 2006).

Located in the brain stem, the hypothalamus lies below the thalamus and is the center for controlling the endocrine system, which manages hormones, emotions, and behavior ("human nervous system"), as well as the autonomic nervous system, which regulates involuntary physiological processes (Kriegbig, 2010; Longe, 2022). In addition, hypothalamus activity is influenced by information from cortical areas, such as the anterior cingulate and central nucleus of amygdala (Kriegbig, 2010). These limbic structures and systems in the body communicate and interact with each other to create an affective experience. Proposed in 1949, MacLean's limbic system model suggested how changes in the world resulted in bodily changes, and messages about these bodily changes would be sent to the brain and continually integrated with its current perception

of the outside world (Dalglish, 2004). Sensory information is received by the brain stem and then passed on to the limbic system. Subsequently, limbic system structures – specifically the hypothalamus, amygdala, and hippocampus, and parts of the thalamus – produce physiological changes that are carried out by the endocrine and autonomic nervous systems (Longe, 2022). For instance, after sensing danger, the brain sends a neural signal to the pituitary gland to release the ACTH hormone, causing the adrenal glands to produce cortisol – an anxiety hormone that induces the “fight-or-flight” response – which result in physiological changes, such as increased heart rate and respiration. (Longe, 2022).

Mechanisms of the Auditory System

Sensory activity begins in the ear, which is split into three divisions: external, middle, and inner. Sound waves from the external environment vibrate the eardrums, which are connected to ear bones that carry sound waves to the cochlea in the inner ear. The cochlear hair cells then turn the mechanical sound waves into neural signals that are sent to the brain by the auditory cortex in the temporal lobes (A. Bennet & D. Bennet, 2008; Schaefer, 2017). Boso et al. (2006) suggested that the processing of musical stimuli mainly occurs in right hemispheric structures, but a later study by A. Bennet and D. Bennet (2008) revealed how the whole brain is involved in musical processing. The temporal lobe in the right hemisphere detects musical elements such as pitch, harmony, and beat, while the temporal lobe in the left hemisphere evaluates lyrics and changes in rhythm and frequency. Finally, the frontal lobe connects the auditory information with thought and interacts with the limbic system to induce emotions (A. Bennet & D. Bennet, 2008).

Physiology of Music-Evoked Emotions

Music evokes responses in limbic structures, such as the amygdala and hippocampus (Koelsch, 2010; Koelsch, 2014; Schaefer, 2017). The amygdala receives information from the central auditory systems and processes emotions in response to the sensory information. The hippocampus plays a role in forming social attachments – music acts as a social function for creating and maintaining social connections – and long-term musical emotive memory (Schaefer, 2017). Certain musical features are associated with specific

physiological responses; consonance influences the paralimbic and cortical brain areas, musical tempo is related to cardiovascular dynamics, and loudness is associated with “psychoneuroendocrinological” responses to music (Schaefer, 2017). Furthermore, musical tension constructed through structural and tonal fluctuations contributes to physiological activity. The buildup of tension is perceived as unpleasant stimuli, and the resolution of tension is affiliated with relaxation and reward, which ultimately activates brain regions associated with reward such as the amygdala, hippocampus, and other structures in the limbic system. (Koelsch, 2014).

Along with activating parts of the brain, listening to music can also affect the autonomic nervous system, as shown through changes in heart and respiration rates, temperature fluctuations, and skin responses (Habibi & Damasio, 2014). Neuroendocrine changes (hormonal changes in the brain and body) also occur in response to music due to physiological processes. For instance, cortisol is a hormone that is associated with psychological and physiological stresses, and listening to classical choral, meditative, or folk music decreases the level of cortisol (Schaefer, 2017).

Pleasant vs Unpleasant Music

When listening to music is a pleasurable experience, the listener may experience physiological changes such as increased heart rate, respiration, and decrease in temperature. Pleasant music has also been shown to activate the dopaminergic reward system and lead to an increase in endogenous dopamine release (Habibi & Damasio, 2014). Additionally, pleasant music activates brain structures, including, but not limited to, the inferior frontal gyrus, the ventral striatum, and the anterior superior insula (Boso et al., 2006). On the other hand, when the listener perceives the music as unpleasant, the human sensory system is incapable of properly discerning dissonant stimuli, causing an irritating sensation (Habibi & Damasio, 2014). Consequently, Habibi and Damasio (2014) and Koelsch et al. (2006) found that unpleasant music activates the amygdala, hippocampus, parahippocampal cortex, and the temporal poles, whereas pleasant music leads to deactivations in those structures. Certain negative induced emotions, such as fear, result in an increased heart rate. Other emotions, such as non-crying sadness, result in a decreased heart

rate (Kriegbig, 2010).

Expressing and Perceiving Emotions

Music can express emotions. Features of music, which include but are not limited to, tempo, consonance, harmony, timbre, and rhythm, contribute to the expression of music (Juslin & Laukka, 2004; Schaefer, 2017). Different emotions are composed of different groups of features, and multiple emotional expressions may use the same feature in a similar manner. For instance, a slow tempo and soft dynamics are utilized in the expression of sadness (Habibi & Damasio, 2014), but the expression of tenderness often also involves a slow tempo (Juslin & Laukka, 2004).

While the composer or performer intends to express a certain emotion through the music, the listener forms their own perception of the musically expressed emotion. Emotional perception is a “cognitive process” that does not require emotional involvement of the listener because it is purely how the listener perceives, or discerns, the emotions that are being expressed by music (Juslin & Laukka, 2004). For instance, listeners may perceive sadness from a piece of music but do not personally experience sadness while listening to it (Corrigall & Schellenberg, 2013). Juslin and Laukka (2004) proposed that the perception of emotions has been investigated in two ways: “listener agreement” and “accuracy”. Listener agreement refers to a common agreement among listeners about the emotions the music expresses, and accuracy is the comparison between the listener’s emotional perception and an independent criterion, which is typically the emotion that performer or composer intended to express through the music.

Music-Induced Emotions

While perceiving emotions when listening to music does not require emotional activity, music can induce emotions in listeners (Scherer, 2004). Evidence of music-induced emotions primarily comes from self-report, behavior, and physiological changes. Self-report allows the listener to respond verbally (questionnaire, adjective checklist, etc.) or non-verbally (drawing a picture, moving a slider, etc.). However, self-report is not always the most reliable, so measuring behavior, or products of behavior, is used as another method. This involves tracking facial expression, body language, or less blatant reactions

such as purchase intentions (Juslin & Laukka, 2004). It is important to note that the intended expression of emotion in the music may not correspond with the emotions induced in the listener (Corrigall & Schellenberg, 2013). For instance, a musician may be trying to express sadness through their performance, but the listener may feel nostalgia, or even happiness, because the performance reminds them of a fond memory with a loved one. Understanding personal preference and context are vital for understanding music-evoked emotions.

Basic vs Aesthetic Emotions

Music can evoke a wide range of emotions for the listener, but many studies have focused their research on more basic emotions, such as happiness and sadness. Scherer (2004) uses the term “utilitarian” to describe these basic emotions that have been typically used in emotion research. These utilitarian emotions are crucial in adaptation and adjustment to external stimuli, and these are associated with fundamental life issues, like fear with danger, loss with sadness, and social cooperation with happiness (Juslin & Laukka, 2004; Scherer, 2004). However, listening to music may evoke emotions that are not linked to survival instincts, and oftentimes appreciating a piece of music is not relevant to personal needs at all. Scherer (2004) describes these emotions as an “aesthetic” experience, which “are not proactive but rather diffusely reactive” (p. 244). Aesthetic emotions are entirely based upon appraisal of auditory stimuli, and some common physiological responses include goosebumps and shivers (Scherer, 2004).

With basic and aesthetic emotions in mind, a study conducted by Juslin and Laukka (2003) revealed how basic emotions are more accurately expressed and perceived because their expression is dependent on musical features that are similar to elements of vocal expressions of emotion, such as loudness, rhythm, and timbre. Pereira et al. (2011) also suggests that “basic emotions are the immediate affective responses to music” (p. 1). Juslin and Laukka (2004) demonstrated how basic emotions like happiness and sadness were most commonly felt in listeners, while complex aesthetic emotions, such as jealousy and confusion, occurred much less often.

Emotional Modeling

Emotions are deeply subjective experiences, and it is difficult to conduct research on such a phenomenon. However, Scherer (2004) describes three major practices that have been used to measure emotions. The first one is a basic emotion model that focuses on discrete emotions. It assumes that an affective state induced by music is like the affective state in “real life”, and it suggests that there are between seven and 14 basic emotions that each have their own “eliciting conditions” and “specific physiological, expressive, and behavioral reaction patterns” (p. 246). However, this model is not fit to fully encapsulate the depth of music-evoked emotions. The second practice is the two-dimensional valence-activation model, which has become widely used in affective research. Valence, the pleasant-unpleasant scope, and activation, or arousal, are central to the emotional experience, and this model is more realistic in describing the emotional response to music. Unfortunately, representing a feeling in only two dimensions is limiting because many emotions may have similar valence-activation representations. The third practice is an eclectic approach that uses affect labels that the researcher deems relevant to their study. There is great flexibility for the labels that can be utilized, and this model best represents the complexity of emotional experiences from music. But this model may not be as reliable because the labels are uniquely chosen for each study, preventing any comparison of data with other studies (Scherer, 2004).

Selecting Music and the Emotional State

Listening to music has been shown to affect the listener’s emotional state, but the inverse is also true, as one’s emotional state influences the music they choose to listen to. Research has shown how music can serve self-regulatory functions, especially with self-identified sad music (SISM), and many people use music as a tool to regulate their mood and emotions (Cook et al., 2019; Van den Tol & Edwards, 2014). Van den Tol and Edwards (2011) defines mood regulation as processes in which mood states can be managed, and self-regulation as handling all psychological processes related to the self. Specifically in times of crises, music listening can be a crucial self-regulatory tool, as listening to music was especially beneficial during the COVID-19 pandemic as a form of mood regulation (Gibbs & Egermann, 2021).

Music Serving as Self-Regulatory Strategies and Functions

Van den Tol and Edwards (2011) suggests that regulation involves the use of strategies, which are “conscious and unconscious goal-directed activities aimed at achieving certain outcomes” (p. 3). Van den Tol and Edwards (2011) conducted a study on why people listen to SISM when experiencing emotional distress, and they discovered several emerging self-regulation strategies that music listening served, such as connection between their own affective state and the emotional expression of the music, memory triggers, high aesthetic value, and message communicated. With these strategies, music can serve various functions as a self-regulatory tool. These include experiencing affect, cognitive appraisal, retrieving memories, acting as a friend, providing distraction, and mood enhancement (Van Den Tol & Edwards, 2011). Furthermore, Juslin and Laukka (2004) found that people most commonly listen to music to “express, release, and influence emotions” (p. 232). All in all, the listener’s affective state influences the music they choose to listen to because the process is dependent on how they want to regulate their affective state. For instance, if one wants to enhance their current emotions and experience them more deeply, they may listen to music that they find an affective connection with.

Importance of Preference and Association

In the music-selection process, personal preference and context is a key factor. The listener’s past experiences influence how they perceive and choose music for their personal self-regulatory goals. For instance, slow music is often associated with relaxation, but someone may have a negative memory associated with a specific slow song because it reminds them of a lost loved one, so they would not choose to listen to that slow song for relaxation. The way that someone emotionally responds to music is greatly influenced by their personal associations to the piece of music (Walworth, 2003), ultimately affecting when and how they would choose to listen to that music again in the future. Consequently, little material was found regarding the relationship between the affective state and selecting music because this process is a greatly subjective experience, making it difficult to quantify this information and reliably collect data about this relationship.

Conclusion

This review explores how music and the emotional state exist in a reciprocal relationship; music expresses and induces an emotional state by activating the limbic system in the brain and evoking physiological changes, while the emotional state influences the listener's music choice through self-regulatory goals and personal preference. This close connection between music and the affective state could be utilized in strengthening the effectiveness of music therapy or behavioral management, perhaps in the classroom or in child developmental environments. Also, the concepts discussed in this review were generally broad, as minimal research has been specifically conducted in relation to emotions related to music listening. Future directions could include investigating behavioral changes in response to certain genres of music and examining the situational and subjective component of music-evoked emotions.

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The Perception of the Accessibility of the United States Healthcare System for Asian Immigrant Women

By Madison Zhan

Author Bio

Madison Zhan is a junior at Stuyvesant High School in New York. She is passionate about the psychological and anthropological views of gender equity and social justice, and she hopes to continue conducting research in these fields and fighting for equality.

Abstract

Asian immigrant women living in the United States (U.S.) are more likely to encounter barriers when accessing the U.S. healthcare system. These challenges can include language differences between physicians and patients, cultural incompetency within the healthcare system, and discrimination. Additional qualitative research is needed to better understand the unique perspectives and needs of Asian immigrant women living in the U.S. The objective of this research is to study the U.S. healthcare system from the perception of Asian immigrant women and explore potential challenges and experiences with discrimination. The methodology for this study was a qualitative interview design using a thematic analysis approach. A convenience sample of $n=7$ Asian immigrant female study participants was recruited. The themes from the qualitative analysis included cultural differences, cultural barriers, language, healthcare accessibility, and potential improvements to the U.S. Healthcare System. More research should be done regarding the extent to which immigrants actively seek out and utilize healthcare services dedicated to educating and assisting immigrant populations. Further research is needed to understand how non-English speakers can be better informed about the healthcare options and translation services available.

Keywords: Immigrants, parents, Asian, language barrier, reliance, lack of support, family, culture competency, culture, racism, discrimination, healthcare, U.S. healthcare system.

Introduction

Asian immigrant women living in the U.S. are more likely to encounter barriers when accessing the U.S. healthcare system. These challenges include language differences between physicians and patients, cultural incompetency within the healthcare system, and discrimination (Clough et al., 2013). Discrimination against Asian immigrants is a serious concern in a society that strives toward equity. Studies have found that Asian immigrants are susceptible to misunderstandings between physicians and patients, delayed treatment-seeking behaviors, mistrust of the medical system, and poor quality of care (Clough et al., 2013). The purpose of this research is to increase awareness of the challenges faced by Asian immigrant women when accessing the U.S. healthcare system. This research highlights the inequities faced by Asian immigrant women living in the U.S.

Research Question

How is accessibility of the U.S. healthcare system perceived by Asian immigrant women?

Literature Review

The definition of cultural competence is the ability of an individual to establish interpersonal relationships that supersede cultural differences by understanding the importance of social and cultural influences on patients, taking into account how these factors interact, and developing appropriate interventions (Beach et al., 2005). Data from this study demonstrated strong evidence that cultural competence training affects healthcare providers' knowledge and impacts patient satisfaction. Positive outcomes are associated with interventions that teach general cultural concepts, specific cultures, or both. Notably, healthcare professionals who possess cultural competence may be more skilled in eliciting patient histories and, therefore, more accurate diagnoses (Beach et al., 2005). However, effective training interventions can be challenging to conduct due to the diversity of curricular content and methods.

The U.S. Department of Health and Human Services' request for the public's input on Culturally and Linguistically Appropriate Services (CLAS) standards suggests that tackling the range of encounters that occur in healthcare settings requires

cultural competence to broaden. Based on 2000 census data, from 2000 to 2030 the percentage of Asian and Pacific Islanders is expected to increase by 285% (Parker, 2010). When dealing with non-White elderly individuals living in long-term care facilities, there can be problems with meeting language, cultural, and religious needs. Language differences are not the only barrier to cross-cultural understanding. There is a greater need to improve overall communication skills, reflection, and self-awareness to increase understanding between Asian immigrants and healthcare workers. It is essential for healthcare workers to acknowledge different diversity factors at stake (Parker, 2010).

Being foreign-born increases the odds of Asian and Latino individuals reporting discrimination (Lauderdale et al., 2006). Foreign-born Asian individuals, along with foreign-born Black and Latino individuals, are more likely to report discrimination after adjustments are made to care access, socioeconomic status, and home language (Lauderdale et al., 2006). Sources of usual care are linked to discrimination reports, especially for the emergency room. Respondents in previous research were asked if there was a time when they believed they would have received better quality medical care if they were from a different race/ethnic group; 16% of Black, 15% of Latino, 13% of Asian, and 1% of White individuals reported this perception (Lauderdale et al., 2006). Those born in a foreign country report significantly higher rates of discrimination. This trend suggests that being foreign-born itself may increase the risk of encountering or perceiving discrimination in healthcare settings. This is likely due to conflicting cultural beliefs regarding health care or structural barriers to access. The data from this study could not determine the key cultural, structural, or psychological factors that may increase perceptions of discrimination in foreign-born individuals or the accuracy of self-reports (Lauderdale et al., 2006). It would be misleading to omit immigration status in discussions regarding discrimination in healthcare as nativity plays a pivotal role in how Asian and Latino individuals perceive discrimination (Lauderdale et al., 2006).

There is a positive correlation between racial discrimination and anxiety/depression among Asian Americans (McMurtry et al., 2013). Research shows that encountering racial discrimination, in the form of institutional obstacles or interpersonal incidents,

is a detrimental stress factor in individuals' lives (McMurtry et al., 2013). When asked, 13% of Asians reported that they felt discriminated against when they went to a doctor or health clinic (McMurtry et al., 2013). Fear of facing discrimination causes Asian immigrants, especially women, to avoid formal medical care (McMurtry et al., 2013). The positive correlation between Asian discrimination and health issues suggests that racial discrimination threatens the physical and mental health of Asian Americans.

Research Gap and Objective

Based on the literature review conducted for this study, additional qualitative research is needed to better understand the unique perspectives and needs of Asian immigrants living in the U.S. This research aims to study Asian immigrant women's perception of the U.S. healthcare system and explore potential challenges and experiences with discrimination.

Methodology

Thematic Analysis

This study's methodology was a qualitative interview using a thematic analysis approach. The primary researcher reviewed interview transcripts line by line. Thematic analysis was based on keywords related to perceptions and challenges in the United States healthcare system. For example, codes and themes were identified if participants mentioned "language barrier," "reliance on family," "discrimination," etc. The themes were categorized using Microsoft Word. Codes and themes were analyzed for similarities and differences between the interview transcripts. Interviews with individuals who were patients were compared to interviews with individuals who were healthcare professionals to explore varying perspectives about the U.S. healthcare system.

Study Participants

A convenience sample of n=7 study participants was recruited to participate in the study. All study participants were Asian American women who had immigrated to the U.S. Three study participants were healthcare workers. One was a physician.

Interviews

All participants, except for one, were contacted via messaging applications and email to schedule an interview time. Four interviews were conducted on Zoom, and three interviews were conducted via written format due to language limitations. Interviews were transcribed using either the Otter or Zoom software platform. Notes were taken during and/or after each interview by the primary researcher. Interviews ranged from 30 to 60 minutes in length.

Participants were asked about the accessibility of the U.S. healthcare system when they first immigrated, how understandable the system is for them now, what barriers they faced when accessing the system, and their overall perception of the system. Participants were also asked their opinions regarding possible accessibility solutions. The physician participant received adapted interview questions centered on her experiences with immigrant Asians, how the U.S. healthcare system already accommodates immigrants, what the U.S. healthcare system can do to eliminate boundaries, and their opinion on NGOs that help Asian immigrants achieve better healthcare.

Ethical Considerations

The primary researcher informed study participants how their identifying information would be protected. All study participants provided informed consent prior to participating in this study. A potential risk was triggering traumatic memories of healthcare events. To minimize the risks and discomfort, participants were provided the questions beforehand and given the option to decline to answer any questions or take breaks from the interview at any time.

Data Management, Security, Anonymity of Informants

Data was stored on a personal computer, and paper notes were stored in a private location. Personal identifiers were removed from the data after the transcription process.

Results

Cultural Differences

While conducting the interviews, several common themes became apparent. Study participants mentioned the differences between Asian and Western medical philosophies. A surprising result from a qualitative interview was the differing perspectives on the use of painkillers in Asian countries versus in the U.S. One participant shared their experiences with varying perspectives on medication use.

“[People in China and Chinese American immigrants] don’t like to take so many medications. And then, of course, here in America, people sometimes joke, ‘No, darling, you’re popping a Tylenol like it’s candy.’ You know, you can turn around and just ask anybody, ‘Do you have Tylenol?’ and a lot of times people have a bottle in their bag, which was really surprising to me, at least when I first started in nursing school.”

Cultural Barriers

When asked about experiences regarding cultural barriers, especially Asian immigrants who did not want to use Western medicine, one interviewee discussed her concerns.

“Yes! Especially in my field like psychiatry. There’s a negative stigma about mental health. A lot of times I will tell the Asian mother, ‘Your child is really depressed, and we have medications for it. It really works!’ And they’re like, ‘No, I don’t want medications.’ ... And a lot of times I let them know they have high blood pressure and will need to take medications for blood pressure. It’s the same thing for depression. There’s a need to educate and give information. Some of them hold on to old cultural values, like those around giving birth and not getting up to do stuff.”

Cultural differences can make it difficult for doctors and Asian parents to agree on the medicine to give children, and the resulting reluctance to use Western medicine may interfere with children receiving the best medical care. This interviewee provided an example regarding their attempts to treat children with ADHD.

“The kids really struggle with sitting still, learning,

and doing their homework. Once you treat their condition, the kids are good at school! They’re able to follow instructions and do really well in class. It’s better to acknowledge a mental health condition like ADHD instead of saying, ‘My kids are just lazy, he doesn’t do anything and just plays video games.’ I point out to them I don’t think he’s lazy, it’s hard for him to focus so he gives up. And then after we treat that condition and you see a big turnaround, they’re able to follow instructions, do their homework, study and they get the grades. You know it’s not laziness per se, it’s just that he has problems focusing.”

Another component of this theme is dependence and the impact of cultural barriers.

“Because of the language and cultural barriers ... Asian mothers may not be in a position to advocate for themselves. They may be fearful of asking questions because culturally you just listen to what the doctor says. You don’t know better ... Westerners who are more educated and more tech-savvy would have already done some research on their own. They would raise issues and tell the doctor I did all this research online and here’s what I think is going on. Without a language barrier, Westerners are often more effective at advocating for themselves. Asian immigrants ... tend to say: ‘I will listen to whatever you think is best.’ I have a role in their decision-making, but all I should be doing is giving them the information they need to make the best decision for themselves and their family. This is often new to them.”

Language and Healthcare Accessibility

The English-speaking interviewees (n=4) noted they felt the U.S. healthcare system was effective in providing quality and accessible health services. A potential reason for this perspective was the English language skills of these Asian immigrants.

“I was amazed at how quickly you could actually get the service. And it was interesting because I came from a family that has doctors. My mom’s a doctor in China and so I’m familiar with going to hospitals in China. So, I was amazed by how quickly I was able to enter the ER and do all the tests and everything.”

Although these English-speaking interviewees did not have significant issues when communicating with doctors, their parents did. Many

of the informants' parents relied on professional translators or family members to communicate effectively with their doctors.

This theme included the dependence of older immigrant family members on younger, English-speaking family members to serve as the primary point of contact. This dependence on family members or interpreter services presents a complicated barrier for these patients seeking care. This was echoed during interviews with non-English-speaking participants.

“Language is the biggest barrier for immigrant Asians when it comes to the American healthcare system. Even if written information is offered in our language, we are afraid to pick up the phone and speak to secretaries who don't speak our language and then visit doctors who don't speak our language. I rely on my English-speaking children to help me do everything, from call[ing] Medicaid and doctors to taking me to appointments and explaining to me the options I have.”

The reliance on family members to serve as translators persisted throughout the interviews, signaling that there are not enough translation-interpretation services accessible in the healthcare setting. A healthcare professional interviewee expressed similar problems.

“Interpretation is available, and there are three versions of it: via telephone, and in-person – which is hard to come by now so it should be pre-arranged. And now they have these iPad rovers. The iPad sits on a rolling stand, and it is rolled into the patient's room and then there's an actual video and audio interpreter going on. Sometimes the rover has specific Asian dialects like maybe Fujianese, but beyond that it is limited.”

This interviewee continued to share that there are thousands of languages spoken by Asians, with many dialects. When asked how the language barriers affect Asian immigrants obtaining medication, the healthcare professional explained the importance of translators at insurance companies. This interviewee also discussed how Asian immigrants may prefer pharmacies where the employees speak their native languages.

“Hopefully, someone at the insurance company speaks your language and can clarify the situation. [Some Asian immigrants prefer] smaller local pharmacies that speak Asian languages and can give them some guidance on medication or answer any questions they have.”

Potential Advancements to the U.S. Healthcare System

When asked about possible improvements to make the U.S. healthcare system more accessible, the interviewees stated a need for more translation services, multi-language medical forms, transportation services for the elderly, guidebooks to help immigrants learn the differences between the U.S. healthcare system and their ethnic country's healthcare system, more outreach to spread awareness of available resources, and more inclusive, free healthcare. In addition to language services, participants expressed that English-speaking physicians should improve their cultural awareness. The physician interviewee shared her personal success in assisting fellow physician colleagues in preparation for interactions with Asian immigrants.

“[We] help non-Asian healthcare professionals to better understand Asian patients. [The patients and their families] don't know what's going on. [It is] easier for [physicians] to learn from a colleague who has had a similar experience rather than from a patient.”

One participant discussed the importance of interpretation services across multiple fields within healthcare.

“You need to ensure health care providers like nurses, occupational therapists, doctors, physical therapists, speech therapists, and pharmacists can all provide services in Asian languages as all this is important. There needs to be diversity in the medical field. ... Facilities that are predominantly white people, English speaking, seem so inaccessible to someone who is Asian or another minority group.”

Several participants in this study mentioned the importance of non-profit organizations that help Asian immigrants access healthcare in their native languages. Participants shared that non-profit organizations have limited resources and face logistical

issues for patients receiving care.

“For example, we arrange for a mom to receive care at a hospital, but they live so far away that it would take them a whole day to get there and back by train. They need to take time away from work, and if they don’t work, they need to think about feeding and caring for family members at home. So maybe it is just audio social services that you can provide. Or possibly car service to reduce their travel time from 90 minutes to 30 minutes each way.”

Discussion

The results from this study effectively answered the research question. The combined literature review and qualitative research study provide information on the perceived accessibility of the U.S. healthcare to Asian immigrants. The themes from the qualitative analysis included cultural differences, cultural barriers, language, healthcare accessibility, and potential advancements, which are consistent with previous literature.

This study found that cultural differences exist between Asian and Westernized cultures regarding medication use and medical philosophies. These cultural differences were also referred to in previous research, which found that a reason for immigrants encountering/perceiving discrimination in America’s healthcare system may be contrasting cultural beliefs and a lack of cultural competency (Lauderdale et al., 2003). The cultural barrier theme in this study referred to a lack of willingness of some Asian immigrants to accept Western medicine (such as mental health treatment) and a lack of self-advocacy. Previous studies have examined rates of healthcare utilization in minority groups and found that Asian Americans may underutilize mental health services due to cultural factors and help-seeking behaviors (Sue et al., 2012).

The theme of language and healthcare accessibility was characterized by participants who were fluent in English and reported easier access to healthcare services compared to participants who were not fluent in English. Non-English-speaking immigrants frequently relied on family members for translation assistance. Older non-English speaking immigrants also reported more challenges

when communicating with physicians and seeking healthcare. These findings are consistent with articles identified in the literature review that discussed the language challenges experienced by older Asian immigrants (Parker, 2010). The final theme in this review focused on advancements for the U.S. healthcare system: improved translation services, physician cultural training, and access to transportation for healthcare appointments. Previous research found that cultural misunderstandings can be minimized with cultural competency training, which improves health outcomes (Beach et al., 2005; Horner-Johnson et al., 2014).

Limitations

A limitation of this study is the small sample size of individuals who completed the qualitative interview. The small sample size may limit the generalizability of the results to the extensive Asian immigrant population living in the U.S. Another limitation is the inclusion of only female participants in this study, which excludes perspectives from male Asian immigrants.

Future Research

After analyzing the interviews and literature, it is possible to identify the most realistic and helpful policies that could make the U.S. healthcare system more accessible for Asian immigrants. Medical forms and information should be expanded to languages other than English, with improved advertisement of healthcare service organizations to diverse communities. Comprehensive education on cultural differences regarding medical philosophies should be incorporated into medical school training to ensure doctors understand their patients’ points of view. Research should also be done regarding the extent to which Asian immigrants actively seek out and utilize healthcare services dedicated to educating and providing assistance to immigrant populations. Further qualitative research is also needed to understand how non-English speaking immigrants can be better informed of the healthcare options available to them and how they can more easily access language translation services.

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