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Immerse Education Research Journal

2024 RESEARCH SYMPOSIUM WINNING PROJECTS
MEET THE WINNERS
TIPS AND RESOURCES
JUDGES COMMENTS

NOVEMBER 2024 VOLUME 1 NO. 2
Transformative Educational Experiences

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About the competition

The Symposium celebrates excellence in research by high school students who have recently completed their Online Research Projects through Immerse Education.

The three shortlisted projects were chosen based on their:

- Quality and depth of research, including the use of relevant sources.
- Clarity, structure, and referencing of the written paper.
- The ability to clearly outline and summarise research and ideas.
- The ability to engage their audience with thought-provoking topics and detailed explanations of complex concepts.
- Support and guidance received from tutors as part of the research process.

Each shortlisted participant presented to a live audience. You can view their presentations here.

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Whether you take a Group, Accredited, or classic Online Research Programme, these virtual experiences offer an unparalleled opportunity for students aiming to refine their research and study skills ahead of university. The bespoke programmes stand out by allowing participants to immerse themselves in a subject of their choice, under the guidance of esteemed tutors from top institutions.

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- Certificate of attendance

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£745

The option for students looking to sharpen their minds and research skills with other peers.

Runner Up, Cecilia Passa

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CECILIA'S BIO:

Cecilia is a 15-year-old Year 11 student at St. Catherine's British School in Athens, Greece. She is researching the impact of environmental toxins on autism spectrum disorder, focusing on Chromodomain-helicase-DNA-binding protein 8.

The Role of Stem Cells in the Female Reproductive System: Insights and Therapeutic Potential

INTRODUCTION TO STEM CELLS AND THE FEMALE REPRODUCTIVE TRACT

Stem cells, characterized by their unique ability to self-renew and differentiate into various cell types, hold the potential to revolutionize medical treatments and deepen our understanding of human development. More specifically, stem cells are human cells which have the capability to develop into a range of different cell types such as muscle cells and brain cells, even potentially fixing damaged tissues.

The Waddington landscape indicates this process as it is a diagrammatic representation of the natural restriction of cell differentiation during normal development of how a cell progresses from an undifferentiated state to a differentiated state during this process. They can be divided into two main categories: embryonic stem cells and adult stem cells.

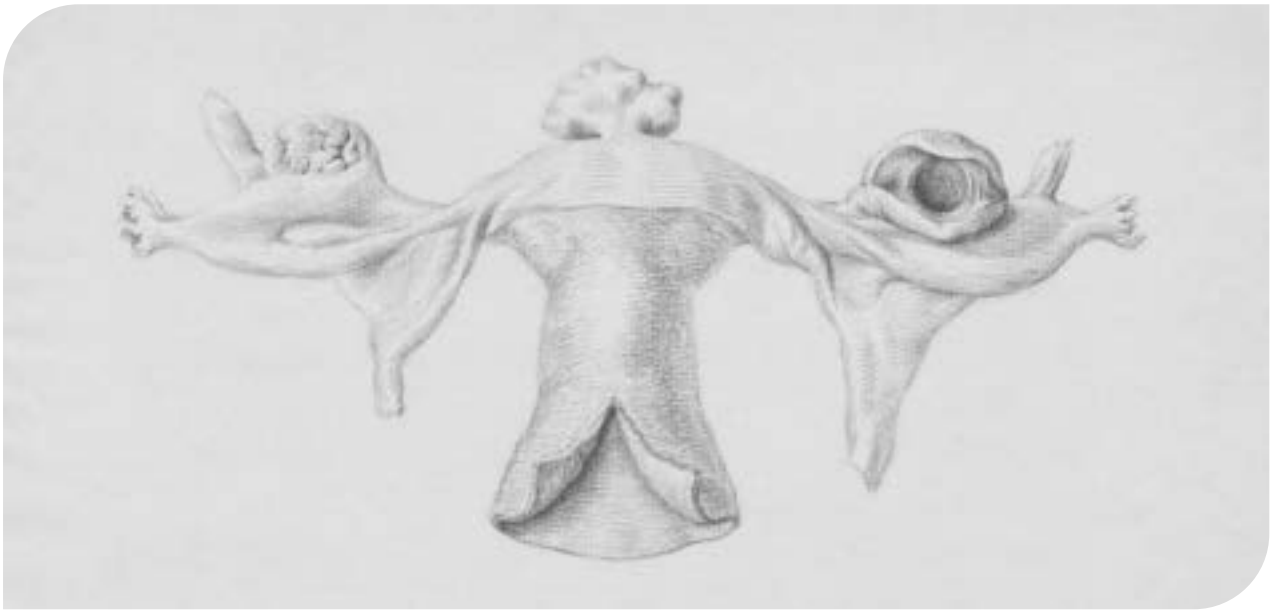
Embryonic stem cells are characterized as pluripotent which means that they can turn into more than one type of cell, whereas adult stem cells are more likely to generated only certain types of cells, although induced pluripotent stem cells are a possibility where adult stem cells change in the lab to behave like embryonic stem cells. In these two vast categories, stem cells can be often split into several sub-categories based on their "potency", or in other words their capacity to give rise to similar cell types, for example, pluripotent, totipotent and multipotent.

The first is able to give rise to all cell types in an adult, the second to all embryonic and adult lineages and the third to multiple cells within a lineage.

Such lineages are able to occur when the embryo undergoes a process called "gastrulation" shortly after fertilization which subdivides the cells into three layers which are referred to as the embryonic germ layers and are the: endoderm (the cells of internal organs), the mesoderm (muscles and the blood) and the ectoderm (the nervous system and epithelial layers).

Furthermore, embryonic tissues are classified as extra-embryonic ("outside the embryo" referring usually to the cells of the amniotic sac and the placenta which are discarded after birth) and embryonic. Therefore, when classifying stem cells, a multipotent stem cell must make at least two different lineages from the same embryonic germ layer, pluripotent stem cells can make multiple lineages from all three embryonic germ layers but not extra-embryonic tissue and totipotent stem cells can use all embryonic germ layers and the extraembryonic tissue.

Stem cells play a pivotal role in women's health and embryology, offering invaluable insights into reproductive processes and potential therapeutic interventions. They are integral to the maintenance and regeneration of tissues throughout the reproductive system by contributing to the regeneration of the endometrium, repairing damaged ovarian tissue and ultimately forming the structures of the developing fetus. However, stem cell use in research often faces numerous challenges such as ethical issues of using embryonic stem cells, hard to grow adult pluripotent stem cells and rejection of the body of foreign embryonic stem cells.



The journey of the egg through the female reproductive tract provides a captivating framework for exploring the multifaceted role of stem cells in women's health and embryology. From the maturation of the egg within the ovarian follicle to its fertilization and implantation in the uterus, stem cells contribute to each stage of this intricate process. By investigating the involvement of stem cells in different segments of the female reproductive system, this research aims to unravel their significance in the body.

The ovaries contain stem cells that can give rise to oocytes and failure of these stem cells can cause Ovarian Cancer and Premature Ovarian Failure.

Firstly, ovaries, being a pair of female glands in which eggs form, are the primary home of an egg cell; although the presence of stem cells in the ovaries remains controversial. On the one side, studies and research carried out hint at the possibility of there being stem cells in the ovaries.

Johnson et al demonstrated that through the isolation of adult mouse and human ovary cells, oocyte-like structures can be formed which are incorporated into follicles where oocytes could be generated in ovaries by putative germ cells (undifferentiated cells that possess the ability of pluripotency and self-replication) in bone marrow and peripheral blood.

The Ddx4 antibody was used in immunofluorescence analysis whereby mouse oocytes were found to not show evidence of cell surface expression although it was proved that they are a contaminating cell type in both adult mouse and human ovaries. More particularly, mouse oogonial stem cells were able to generate functional eggs after intraovarian transplantation. White et al isolated GSCs (glioblastoma stem cells which have similar characteristics to tumors) using fluorescence-activated cell sorting which also used Ddx4 antibodies to obtain GSCs free of oocytes, although it is speculated that these may be somatic stem cells and not GSCs. Ovarian stem cells have been shown to exist although the presence of GSCs has not been demonstrated.

Equally, critical commentaries argue against the possibility of postnatal de novo oogenesis. In a study by Gould et al, follicles were counted in both primordial follicles as well as initial primordial follicles with germline stem cells, reaching an observation of 4-6 months. The results described decreases in follicles over time and the stem cell model failed to describe the changes that they observed in the follicles over time.

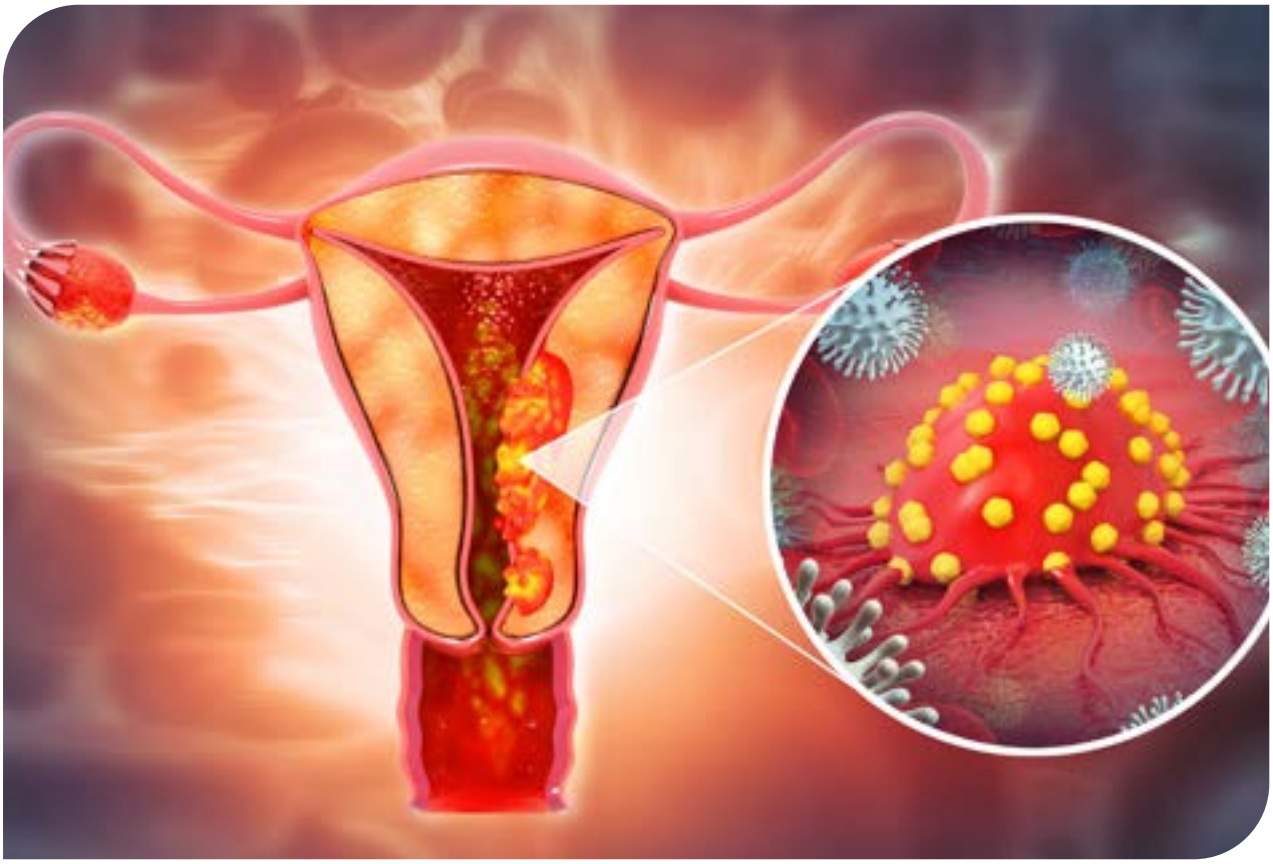
Another study used Ddx4 expressing cells from postnatal mouse ovaries which were found to not enter mitosis or contribute to oocytes, providing evidence that no post-natal follicular renewal occurs in mammals and that there are no mitotically active Ddx4 expressing female germline stem cells.

A similar study indicated that the genes required for meiosis are expressed only in the adult testis and fetal ovary of 23W, where adult ovaries exhibited lower levels in the expression of OCT3/4 and SPC3, showing how genes associated with meiosis are abundant in fetal ovaries but absent in adult ovaries, therefore indicating that such stem cells are present in embryos only.

Finally, the programmed cyst breakdown in mouse ovaries is unaffected by Foxo3 deficiency revealing that the timing of cyst breakdown is identical in both Foxo3 +/+ and -/- ovaries.

Overall, it remains unclear if stem cells are in fact present or absent in the ovaries; although both sides seem to provide strong evidence which however has its limitations. In spite of the generally accepted dogma that the total number of follicles and oocytes is established in human ovaries during the fetal period of life, this new evidence challenges this understanding, and therefore the possibility of postnatal de novo oogenesis would be remarkable for vulnerable sectors in our society such as older aged women in gestation. Regardless, it is widely accepted that failure of such stem cells would be detrimental for the health of the ovaries but most importantly of the woman. The hallmarks of cancer, being: sustaining proliferative signaling, evading growth suppressors, resisting cell death, enabling replicative immortality, inducing angiogenesis, activating invasion, and metastasis are the six biological capabilities acquired during the development of human tumors, which are strangely similar to those of stem cells. The cancer stem cell theory proposes that cancer arises from normal stem cells, usually determined by the acquisition of damage in the stem cells during division, whose accumulation generates CSCs (cancer stem cells) responsible for tumor formation. According to this theory, cell division is crucial not only for tumor growth but also for the malignant transformation of normal stem cells, which is why understanding carcinogenesis remains of utmost importance.

OVARIAN CANCER AND PREMATURE OVARIAN FAILURE (POF)



Ovarian cancer occurs when abnormal cells in the ovary grow and divide uncontrollably, eventually forming a tumor that can spread to other areas of the body through the abdominal cavity, between the ovaries and the fallopian tubes, following the retrograde menstruation theory.

Moreover, Premature Ovarian Failure (POF), also known as premature ovarian insufficiency, can result from a depletion of ovarian follicles. This leads to ovaries not making the typical amounts of the hormone estrogen or releasing eggs regularly, leading to infertility and hormonal imbalances.

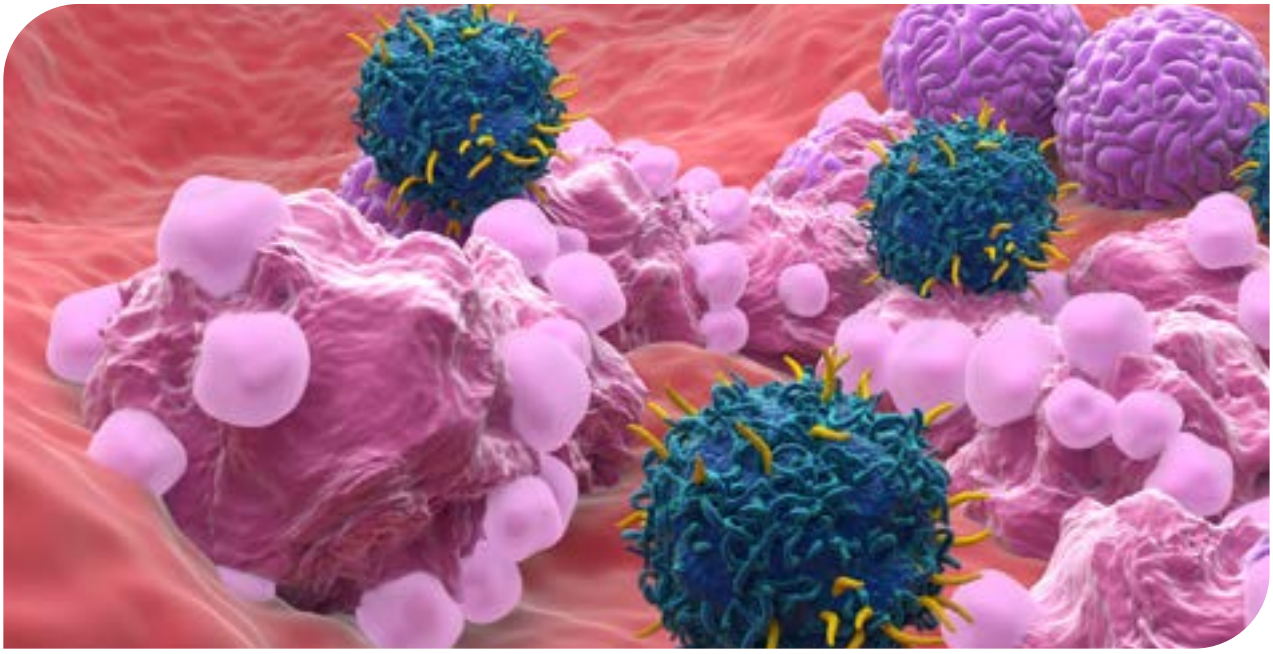
STEM CELLS IN THE FALLOPIAN TUBES AND ECTOPIC PREGNANCY

The role of stem cells in the fallopian tubes involves the replenishing of damaged epithelial cells, which contribute to ectopic pregnancy. As the egg is released from the ovaries, its journey through the fallopian tubes, an important passageway to the uterus, has been found to contain stem cells. In a study by Snegovskikh et al., stem cells have been localized and distributed in the epithelial and smooth muscle layer of the murine oviduct using the LRC approach (showing the location of replication). The fallopian tube also has a pool of stem cells available for repair and regeneration processes.

Within the epithelium, a subset of stem cells demonstrates remarkable plasticity, contributing to the continuous regeneration of the tubal epithelial lining. These cells play a crucial role in replenishing damaged epithelial cells, ensuring the functionality of the tubal mucosa (tissue that nourishes the moving oocyte or zygote).

Complementary to epithelial stem cells, stromal stem cells within the fallopian tube stroma also play a vital role in tissue maintenance and repair. These stromal stem cells contribute to the dynamic remodeling of the tubal stroma, facilitating structural support and epithelial-stromal interactions essential for tubal physiology.

In ectopic pregnancy, interactions between fallopian tube stem cells and embryonic cells contribute to the implantation of embryos outside the uterine cavity, leading to potentially life-threatening complications. Additionally, stem cell alterations have been associated with tubal disorders such as hydrosalpinx, salpingitis, and tubal scarring. Finally, Paik et al. have demonstrated that the stem-like epithelial cells in the distal fallopian tube are expanded in precancerous lesions of the tube and in the tubes of women with ovarian cancer.



UTERINE STEM CELLS IN MENSTRUAL CYCLE MAINTENANCE AND GYNECOLOGICAL DISORDERS

The uterus' stem cells maintain the menstrual cycle and support pregnancy, yet they can also give rise to endometriosis, adenomyosis, leiomyomas, and Asherman's syndrome. As the egg moves through the reproductive system to the uterus, the endometrium— a layer of tissue that lines the uterus, shedding about 400 times throughout a woman's reproductive life during a menstrual period through glandular cells that make secretions— and the myometrium, which is the middle and thickest layer of the uterine wall, contain stem cells essential for uterine lining regeneration during the menstrual cycle and after childbirth. Epithelial, mesenchymal, and endothelial stem cells are present in these two layers of the uterus, maintaining the menstrual cycle and supporting pregnancy.

However, these cells have also been implicated in the development of common benign gynecological disorders, including leiomyomas, endometriosis, and adenomyosis.

According to a research review by Testuo Maruyama, the location of stem cells in the endometrium can be clearly demonstrated through the following gland that secretes hormones, showing stem cells in three categories of stromal stem cells (mainly modulating inflammation) and four categories of epithelial stem cells (responsible for normal tissue renewal or regeneration following damage).

THE ROLE OF PLACENTA AND UMBILICAL STEM CELLS IN PREGNANCY COMPLICATIONS

As the egg cells fertilize and eventually form a placenta and umbilical cord, these stem cells have emerged in regenerative medicine and tissue engineering. Placental stem cells share similarities with embryonic stem cells and possess the capacity to differentiate into various cell types, making them valuable for therapeutic applications. However, abnormalities in the differentiation or function of placental stem cells have been implicated in pregnancy complications, such as placenta accreta and placental insufficiency. Umbilical stem cells derived from umbilical cord blood offer immense therapeutic potential due to their multipotent nature and immunomodulatory properties. These stem cells have been explored in various clinical settings, including regenerative medicine and transplantation.

Furthermore, umbilical stem cells hold promise for mitigating complications associated with placental dysfunction by offering a readily available and non-invasive source of regenerative cells.

Placenta accreta, characterized by abnormal placental attachment to the uterine wall, poses significant risks of maternal hemorrhage during childbirth. Recent research suggests that dysregulation in placental stem cell differentiation or function may underlie this condition. Specifically, aberrant signaling pathways governing the invasive properties of placental stem cells could contribute to their excessive infiltration into the uterine wall, leading to placenta accreta. Investigating the molecular mechanisms underlying placental stem cell behavior in placenta accreta holds promise for identifying targeted interventions to mitigate its risks.

CERVICAL STEM CELLS AND THEIR CONTRIBUTION TO CERVICAL CANCER

Stem cells in the cervix maintain the structural integrity and functionality of the cervical epithelium. However, disturbances in the regulation of cervical stem cells can lead to pathological conditions, including cervical cancer. Cervical cancer typically arises from the transformation of normal cervical cells into malignant ones, often triggered by persistent infection with high-risk strains of human papillomavirus (HPV).

Dysregulation of cervical stem cells may contribute to the initiation and progression of cervical cancer by promoting aberrant cell proliferation, impairing DNA repair mechanisms, and facilitating the acquisition of invasive and metastatic properties. Moreover, alterations in the microenvironment surrounding cervical stem cells, such as chronic inflammation and hormonal imbalances, can further exacerbate their dysfunctional behavior and promote tumorigenesis.

SUMMARY OF STEM CELLS IN THE FEMALE REPRODUCTIVE TRACT AND FUTURE IDEAS

In conclusion, this essay highlights the pivotal role of stem cells in the biology of the female reproductive tract, encompassing the ovaries, fallopian tubes, endometrium, placenta, and cervix. Stem cells within these tissues contribute significantly to their development, maintenance, and regeneration throughout a woman's lifespan. Moving forward, innovative regenerative medicine approaches hold immense promise for harnessing the therapeutic potential of stem cells in treating these conditions. Ideas such as induced pluripotent stem cells offer a groundbreaking discovery for generating patient-specific stem cell lines, facilitating personalized regenerative therapies.

Treatment strategies involving the replacement, inhibition, or modulation of stem cells could revolutionize the management of reproductive disorders by promoting tissue repair and regeneration. Additionally, interventions targeting neoogenesis or therapies aimed at depleting or altering the differentiation and self-renewal abilities of stem cells could offer new therapeutic ways to restore reproductive health. Embracing these future ideas in regenerative medicine highlights the transformative potential of stem cell-based therapies to revolutionize the field of female reproductive health and advance personalized treatment strategies tailored to the unique needs of each individual patient.

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JUDGE'S FEEDBACK:

In her essay, Cecilia exhibited a deep understanding of very complex ideas relating to stem cells, clearly expressing her research on these areas to create an engaging and well-crafted piece of writing. Cecilia's passion for medicine and science shone through in both her essay and presentation.

CECILIA'S TIPS:

- Develop a Logical Structure: Before you begin writing, organize your research in a way that is clear and logical, making it easier for readers to follow your findings and conclusions.
- Leverage Your Mentor's Expertise: Don't hesitate to use your mentor as a resource. They are there to help, so ask them any questions you have—no question is too small!
- Use Reliable Resources: Always prioritize trustworthy sources, such as peer-reviewed journals, reputable books, and credible websites.
- Seek Clarification When Needed: If you come across concepts or findings that are unclear, discuss them with your mentor. Their insights can help deepen your understanding.

Winner, Sophia Chiu

SOPHIA'S BIO:

As a senior at Morrison Academy Taipei, Sophia is passionate about psychology, with a focus on research in psychiatric disorders, neurolaw, and mental health treatment. She has furthered her knowledge at the University of Chicago and Stanford University. Sophia runs a mental health club called Helping Minds at school and plans to study psychology or neuroscience at university next year.

A Comparative Approach to Explanations of Anorexia and Bulimia Nervosa

INTRODUCTION TO EATING DISORDERS

A modern illness, eating disorders have been on the rise since the late 20th century. Sociocultural and environmental changes brought by rapid modernization and technology have ingrained the pursuit of beauty, defined by thinness, in society. However, while eating disorder symptoms, like dieting and the pursuit of thinness, are relatively common in society, the prevalence of pathological eating disorders is comparatively low to that of disordered eating habits, with only a select few who actually develop a disorder (Bushnell et al., 2009).

According to the National Institute of Mental Health (NIH), eating disorders (ED) are mental illnesses in which the patient displays severe disturbances and peculiarities in their eating habits as well as distorted thoughts and emotions. While the disorder is presented with distorted eating habits, ED patients also fight the internal battle of an unhealthy preoccupation with food, body weight, and body image. There are multiple variants of EDs, but this paper will focus on anorexia nervosa (AN) and bulimia nervosa (BN).

The NIH characterizes anorexia nervosa (AN) with extreme restrictive eating, akin to starvation. Primary symptoms of AN include extreme thinness, a distorted body image, and an intense fear of weight gain coupled with the relentless pursuit of thinness.

Physical symptoms like osteoporosis, anemia, brittle hair and nails, constipation, low blood pressure, multiorgan damage or failure, and more manifest over time as a result of extreme and prolonged malnourishment. The mortality rate for AN is relatively high as these health concerns increase the risk of death by malnourishment or suicide.

The other type of ED is bulimia nervosa (BN). As Mond (2013) explains, BN is characterized by recurrent episodes of binge eating and extreme weight-control behaviors, at least twice a week for three months according to the DSM-V. Bulimics experience the cyclic struggle of binge eating followed by compensatory behaviors. Binge eating refers to the consumption of objectively large amounts of food in a short period of time, while weight-control behaviors include self-induced vomiting, misuse of laxatives or diuretics, extreme dietary restriction, and excessive exercise. BN is also extremely harmful to one's physical health; inflamed throat, damage to the stomach lining from stomach acid, and the erosion of tooth enamel are common physical signs of BN. Besides physical symptoms, bulimics are also plagued with concerns about weight and body shape, suffering from distorted body image similar to those with AN. However, BN is less identifiable from physical appearance than AN as bulimics tend to fluctuate in a normal weight range.

PREVALENCE OF EATING DISORDERS

Eating disorders affect. 3-10% of people worldwide, and patients mostly fit the demographic of young, adolescent to early-adulthood females, with 15 to 24 years old being the most vulnerable age group (Makino et al., 2004; Polivy and Herman, 2002). According to Miller and Pumariega (2005), eating disorders have been more prevalent in Western cultures and countries. However, illnesses are reportedly on the rise also among people of color as recently more studies have been conducted on minority populations as well. This indicates that the previous lack of research on EDs in minority groups may have contributed to statistical discrepancies and misunderstandings (Miller and Pumariega, 2005).

Comparing the prevalence of EDs between males and females, EDs significantly affect females more than males, with females outnumbering males 10 to 1 (Hsu, 1996). Furthermore, Hsu reports that the disorder is more prevalent in Western cultures in terms of pathology and diagnosis.

0.5% of women suffer from AN and 2% of women suffer from BN in Western cultures. Also, no evidence points to an epidemic of eating disorders, though global incidence rates have been on the rise.

Specifically in AN, a meta-analysis on female AN incidence rates conducted by Martínez-González and colleagues (2020) reveals approximately 0.5 to 318.9 cases of AN per 100,000 women. The researchers further investigated that depending on ICD or DSM classifications and various versions, there is great variability in the incidence rates of AN (Martínez-González et al., 2020). These variations are most probably caused by differing criteria, like weight requirements; stricter criteria may exclude a relevant population of AN patients.

From studying BN, Bushnell and colleagues (2009) report that the overall lifetime prevalence of BN is 1.0%. The overall lifetime prevalence rate for men is 0-2% and 1-9% for women.

PREVALENCE OF EATING DISORDERS

Retrospective studies support this notion as most bulimic patients report their eating disorder beginning during adolescence. In a study done by Gross and Rosen (1988) between high school girls and boys in Northeast America, 9.6% of girls and 1.2% of boys had BN of both subtypes, purging and nonpurging.

Comparing the prevalence rates of AN and BN, bulimic patients outnumber anorexic patients 2 to 1 (Polivy and Herman, 2002). BN patients, though harder to identify with physical appearance, are more likely to seek treatment whereas AN patients more often report indifference toward their disorder and mental state.

Fairburn and colleague's (1999) study reports 14.6 (±3.0 years) and 15.5 (±3.9 years) being the average ages of onset for AN and BN, respectively.

As explained by Martínez-González and colleagues, adolescent and teenage girls, who in this stage of life are going through life-altering physical, hormonal, and emotional changes, are especially vulnerable to unrealistic and unachievable beauty standards normalized by the media.

The researchers claim that the search for the "perfect body" and "perfect appearance" causes an imbalance and primes the pursuit of perfection, or thinness, leading to restrictive diets and disturbances in eating behaviors.

However, not everyone who exhibits disordered eating habits develops an eating disorder. Despite incidence rates that suggest the rarity of eating disorders in the general population, syndrome symptoms are comparatively high and more common. Among women ages 18 to 44, 22.5% report recurrent binge-eating episodes, and at least 5% of diet or use diuretics (Bushnell et al., 2009). Thus, it is clear that many are affected by the symptoms of AN and BN, though few go on to develop an eating disorder. The next question posed is what mediating factors that increase the vulnerability of eating disorder patients.

Approaches

SOCIAL EXPLANATION

When analyzing the explanations of EDs, it is important to consider the relationship between the social environment and EDs. The media, both its content and users, as well as the globalization of Western media, are important factors in ED discussion.

Approaches

CONTENT

The media capitalizes on the image of thinness. By emphasizing the desire for thinness, the media transmits thinness-oriented norms associated with self-control and success (Garfinkel and Garner, 1982). A study done by Tan (1997) reveals that television beauty advertisements cultivate greater estimates of the importance of sex appeal and beauty in adolescent girls than exposure to neutral ads. The author concluded that unrealistic representation of feminine beauty in mass media may push young adolescent girls and media consumers to pursue thinness to a disordered level.

Harrison and Cantor (1997) conducted a study to investigate the relationship between mass media consumption and eating disorder symptomatology, specifically body dissatisfaction and drive for thinness. They found that reading fitness magazines and viewing TV shows that promote thinness positively both correlate with anorexic behavior. The researchers thus concluded that the content of media reinforces norms that support eating disorder behavior. Just as the consumption of thinness-depicting and thinness-promoting media can fuel disordered eating habits, individuals with EDs are also more likely to consume fitness and dieting media than individuals without EDs.

USERS

Users of the media may also use their platform to promote eating disorder behavior. Csipke and Horne (2007) explain that pro-anorexia, or pro-ana, communities are found throughout different media platforms and websites to promote ED behavior. On these platforms, anorexia is viewed as a lifestyle choice, and those who embrace the disorder are praised for their determination, self-control, and self-discipline as a “successful” anorexic. The content of websites usually includes calorie charts, exercise advice, and BMI calculators. Advice is also given on how to hide EDs as well as tips on different ways to lose weight, restrict eating, and more. On some of the more extreme pro-ana websites, one can find doctrines referred to as “ana psalms” or “ana creeds” which outline the rules and guidelines to live an anorexic lifestyle. These doctrines include rules about eating as well as affirmations that beauty is judged by thinness.

Csipke and Horne found that many individuals go on these sites to sustain or incite disordered eating, as participants admitted to visiting these sites to maintain their disorder and to steer away from recovery. Moreover, a trend of worsening body image was found after individuals visited these sites. However, Csipke and Horne note that these websites may also provide emotional support for those struggling with an ED as some websites offer chatrooms for struggling patients to connect with one another. Still, the content presented on these websites is problematic in promoting EDs and glorifying the anorexic lifestyle.

Culture

EXPOSURE TO WESTERN MEDIA

While the demographic of ED patients used to be mainly White adolescent girls, more and more people around the world are being diagnosed with an ED. A plausible explanation for this trend is the effect of Western media on different cultures. The definitions of beauty, health, and success are different under different cultural contexts. However, with the influence of Western media, these cultural definitions may be altered.

In the 1990s, Becker and colleagues investigated the effects of the introduction of television in Fijian society, specifically the prevalence of EDs. Through the cross-sectional study, the researchers found strong, positive correlations between television exposure time and Eating-Attitudes-Test (EAT-26) scores and also with greater instances of self-induced vomiting to lose weight on the other side. Specifically, study results in 1995 revealed that 12.7% of the subjects had EAT-26 scores higher than 20, whereas the percentage rose to 29.2% in 1998.

Within the 1998 sample, EAT-26 scores higher than 20 were significantly associated with dieting and self-induced vomiting, which both are symptoms of EDs. Upon exposure to Western media through television, participants also reported an increased appeal for dieting, weight loss, and Western aesthetic ideals (Becker et al., 2018).

The significance of the Fiji study by Becker and colleagues is that Western ideals of beauty disparate from traditional Fijian beauty and cultural standards. Exposure to media, specifically Western media, reflects a disruption of the traditional preference for a robust and fuller body and the traditional disinterest in dieting and changing the body (Becker et al., 2018). Consequently, it may be interesting to further investigate the manifestation of ED symptoms under different cultural contexts, and how these cultural contexts may change because of modernization and westernization.

Culture

WESTERN IDEAL OF THINNESS AND ACCULTURATION

The Western ideal of thinness holds prominent influence over its people. Miller and Pumariega (2005) found that Western culture prioritizes thinness as White students hold less favorable attitudes about their own body image and have a stricter criteria for thinness compared to African American students. They also found that Euro-American males are more attracted to thinner silhouettes. Another finding is that Black female athletes reported less body dissatisfaction than White athletes. Overall, the trend infers greater body satisfaction in African cultures compared to White cultures. Relatably, in cultures where plumpness is considered attractive EDs are less commonly found, just as in cultures that overvalue thinness weight phobia is more prevalent.

While clear cultural differences in the standard of beauty may explain why EDs are more prominent in Western cultures and affect the White demographic more, growing rates of EDs in minority populations hint at the effects of acculturation. Acculturation refers to the assimilation of a dominant culture, usually referring to the White, Western culture (Miller and Pumariega, 2005). As Western cultures become more intertwined with other cultures, the influence of Western ideals and standards may change how individuals in different cultures perceive themselves under their traditional context.

The aforementioned assumption is illustrated by Abrams and colleagues (1993) as they found a significant negative correlation between the desire to be skinny and a strong Black identity. Furthermore, Miller and Pumariega (2005) found a positive correlation between acculturation and EAT-26 scores.

With the acculturation of mainstream U.S. culture, traditional cultural beliefs and standards of beauty are eroded and replaced by Western culture, explaining why EDs are becoming more prevalent in other cultures.

However, the acculturation of Western culture also poses major implications for the self-esteem of minorities. When minorities are exposed to standards and expectations that are different from themselves, consequences of low-esteem may follow. Williamson (1998) explains that modern-day media is comparison-driven. All users are vulnerable to being judged by their appearance, and all people are subjected to the unrealistic expectations outlined by social media, whether that be social, wealth, or beauty expectations. When one fails to meet the unrealistic expectations, they may feel discontent regarding their situation and as a result suffer from low self-esteem. This poses serious implications for minorities consuming Western media. As Williamson (1998) evaluates, with Western culture highlighting the ideal of thinness on models with Anglican features and a Caucasian appearance, women from other cultures, whose physical features contrast starkly with the ideal, suffer even greater blows in their self-image and acceptance of their appearance. While one may argue that protective cultural ideals shield minority women from the harsh, unrealistic Western standard of beauty, it would be foolish to believe that minority women are immune to Western standards of beauty (Williamson, 1998). Thus, it may be notable to further research how acculturation affects minorities' self-image and how it correlates with EDs.

Biological Explanation

HORMONAL DIFFERENCES

Females outnumber males 10:1 in ED diagnosis (Hsu, 1996). Thus, it is notable to investigate biological and hormonal differences between males and females to understand if there is a biological explanation for the high female prevalence rate for EDs. Culbert and colleagues (2021) published a narrative review studying the biological factors underlying gender-differentiated prevalence rates. They found that prenatal exposure to testosterone, which drives the development of male-typical physical and behavioral characteristics, also known as the masculinization of the brain, works as a protective factor against eating pathology. Prenatal exposure to testosterone contributes to fewer sugar-taste preferences, and lesser binge-eating tendencies and palatable food intakes in males versus females.

Within-male comparisons reveal that lower levels of testosterone predict higher levels of dysregulated eating habits in boys; males with lower levels of testosterone exhibit higher incidences of binge eating, eating concerns, and feelings of loss of control over eating (Culbert et al., 2021). Moreover, in a rodent study, the removal of testosterone in adult male rodents resulted in increases in sucrose consumption (Zucker, 1969). Consequently, testosterone holds a prominent influence in the eating habits of males.

However, within-female comparisons reveal that high levels of testosterone have opposite effects in women than in men. Instead of lower testosterone levels, women with higher testosterone levels experience elevated risks to eating pathology (Culbert et al., 2021). For instance, women with polycystic ovarian syndrome (PCOS), a condition associated with higher levels of testosterone, report increased incidences of BN and binge eating disorder (Thannickal et al., 2020). Similarly, when women with BN were given an antiandrogenic oral contraceptive, which reduces testosterone levels, the hormonal change was associated with decreases in appetite and binge-purge symptoms (Naessén et al., 2007). Therefore, these findings suggest that ED risks in women may be heightened due to high testosterone levels, especially in women with BN.

Culbert and colleagues (2021) further investigated gender differences in neural activation to food-related stimuli. They found that women respond to palatable food stimuli, both visual and taste, with greater activation in brain regions related to executive functioning, inhibitory control, and reward, than men. Additionally, when exposed to food stimuli, men were more able to suppress their desire for food while women were less able to do so, revealing females' amplified brain sensitivity and responsivity to palatable foods. As a result, women may have increased vulnerability to eating habits like overeating and binge eating, and overall increased predispositions to eating pathology.

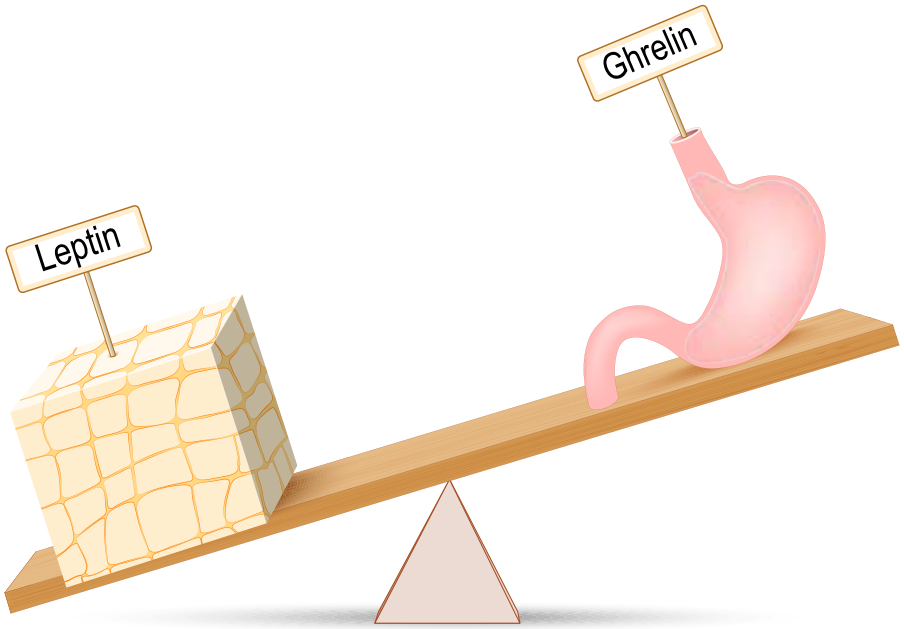
Altered Ghrelin and Leptin Levels

GHRELIN

According to Fabbri and colleagues (2015), ghrelin is a significant hormone involved in regulating food intake. Called the "hunger hormone," ghrelin's main function is to signal hunger. Ghrelin levels are usually high before a meal and fall after food intake. In investigating the relationship between ghrelin levels and body mass index (BMI), Fabbri and researchers found a negative correlation between ghrelin levels and BMI; in other words, obese people have lower levels of ghrelin compared to normal-weight individuals. Another notable activity of ghrelin is that the decrease in ghrelin after a meal was lower in obese individuals compared to control groups, meaning that the feeling of hunger may be maintained in people with obesity even after eating, thereby reinforcing obesity eating habits.

However, in studying ghrelin levels in individuals with AN, studies show that AN patients have higher levels of ghrelin compared to normal-weight individuals. This abnormality may be a result of prolonged starvation in AN, but not as a pre-existing condition. Moreover, these ghrelin levels were normalized after patients regained their normal weight, suggesting that ghrelin levels may be affected by weight and nutritional status. Higher observed levels of ghrelin are also present in BN patients, especially those who participate in fasting and purging (Fabbri et al., 2015).

Thus, it is clear that altered levels of ghrelin in AN and BN patients are a result of endocrine system failure due to starvation, malnutrition, and unhealthy eating habits. However, how ghrelin interacts with the psychological impulses for starvation, binge-eating, and purging remains unknown. If ghrelin levels are high in AN and BN patients, then other factors must explain patients' control to withstand these signals of hunger and reinforce their disordered eating behaviors.



Altered Ghrelin and Leptin Levels

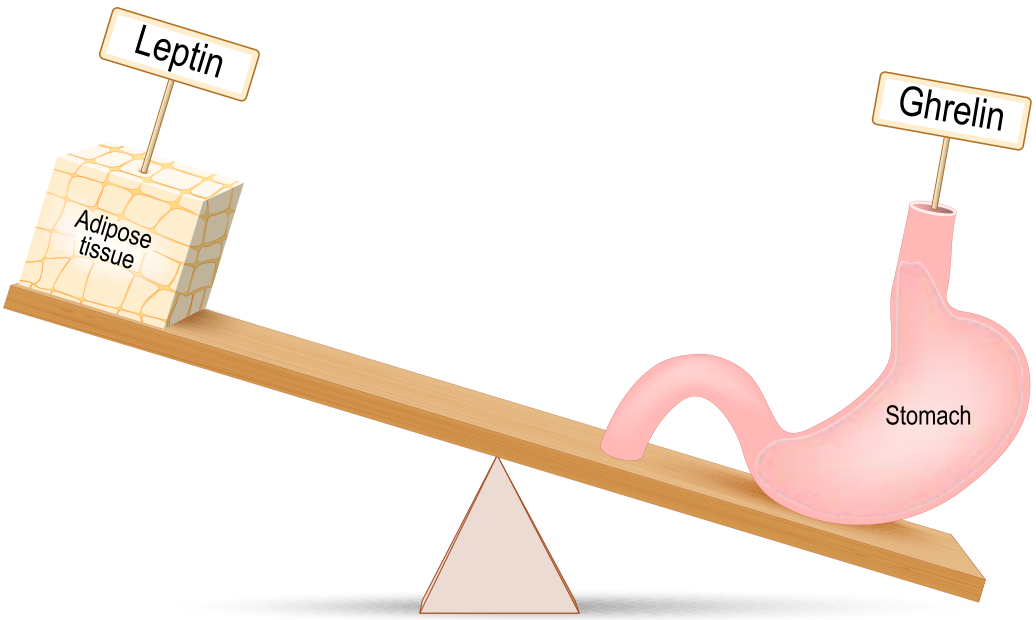
LEPTIN

Leptin, on the other hand, is a satiety hormone that acts as a hunger suppressant signal to the brain. Leptin communicates to our brains that we are full and that we don't need any more food. Unsurprisingly, ED patients have abnormal leptin levels (Monteleone et al., 2000).

As Montelelone and colleagues (2000) explain, leptin levels are severely low in anorexic patients, and these levels positively correlate with BMI and body fat content. Leptin levels are affected by a multitude of factors, including body fat, body weight, and eating patterns. Research shows that restrictive food intake and reduced daily caloric intake lead to decreased leptin levels in AN patients, and conversely, leptin levels return to normalcy during AN recovery. Reduced levels of leptin in AN patients explain the increased hunger sensation in anorexics, but it does not explain how anorexics continue their restrictive eating habits despite their lack of homeostasis and hunger satiety.

Similarly, leptin levels are also significantly decreased in BN patients. Despite bulimics' large caloric ingestion during binges, purging or the use of laxatives compensate for the overeating and ultimately result in a reduced caloric intake for bulimics. Similar to AN patients, BN patients report diminished satiety responses, explained by their reduced leptin levels. Moreover, their impulse for binge-eating can also be explained by their constant feeling of hunger and insatiety due to low levels of leptin (Monteleone et al., 2000).

Consequently, in both AN, and BN, patients experience reduced levels of leptin as a result of caloric deficits, low body weight, and eating habits such as starvation and binging-purging. Leptin levels return to normalcy after patients receive treatment and depart from a state of starvation, suggesting that abnormal leptin levels are an effect of EDs rather than a pre-existing cause.



PERSONALITY EXPLANATION

When discussing the genetics of AN or BN, no direct relationships between specific genes and the onset of development of EDs have been found (Shih and Woodside, 2016). However, personality traits and temperament provide evidence for the possible heritability of EDs.

Personality traits are 40-50% heritable (Culbert et al., 2015). A study by Fassino and colleagues (2002) reported a positive correlation between the temperament and character of AN patients and their mothers'. Thus, it is significant to investigate personality traits that may be risk or predictive factors of AN and BN.

PERFECTIONISM

Perfectionism increases one's susceptibility to developing AN and relates to a higher duration of the disorder and higher relapse rates (Jacobs et al., 2008). According to Jacobs and researchers, mothers of anorexics have more evident perfectionistic tendencies and an increased drive for thinness compared to normal controls.

According to Wonderlich and colleagues (2004), perfectionism, obsessiveness, and affective disturbance are also features of bulimic patients. In fact, patients displaying high perfectionistic tendencies reported the highest levels of ED psychopathology.

However, perfectionism is noted to increase BN symptoms only in patients with low self-esteem and who are overly critical of their bodies and physical appearance (Culbert et al., 2015).

The perfectionist tendencies of BN patients resemble that of AN patients. Thus, more research should be done to further investigate other personality differences between anorexics and bulimics to find the differentiating factor between the two disorders.

NEUROTICISM AND IMPULSIVITY

In 2015, Culbert and colleagues investigated the individual relationships between neuroticism and impulsivity with AN and BN. Neuroticism is the tendency to experience unpleasant emotions such as anxiety and anger. Culbert and colleagues found that negative emotionality and neuroticism predict ED symptoms like drive for thinness and ED diagnoses.

Impulsivity, on the other hand, seems to affect BN patients more than AN as impulsivity relates more to binge eating and purging. Cross-sectional research presents greater levels of impulsivity in BN patients compared to AN patients.

INTERACTION OF BIOLOGICAL AND SOCIAL

According to Jacobs and colleagues (2013), some individuals may have genetic predispositions for impulsive or perfectionistic tendencies that make them more vulnerable to developing an ED. However, personality traits, temperaments, and individual characteristics are not rigid; traits may change with time. As a result, environmental influences, like family dynamics, peer relationships, and more, may influence one's personality development.

Some environments, like ones that promote comparison or competition, may foster personality traits of perfectionism and neuroticism, which then increase one's susceptibility to developing an ED. Consequently, the interplay between the biological and environmental when discussing the influence of personality traits on ED development is deserving of future research.

COGNITIVE EXPLANATION
COGNITIVE DEFICITS

As explained by Lena and colleagues (2004), cognitive deficits may pre-exist in individuals, leading to the development of EDs. The researchers propose that neuropsychological cognitive deficits underlie ED development, causing overt symptoms of disordered eating behavior. In AN, patients present problems with attentional, memory, and visuospatial abilities whereas in BN, patients present deficiencies in problem-solving and visuospatial processing and an impulsive cognitive style. These cognitive deficits are postulated to exist to a degree of severity that ultimately interferes with one's self-esteem, acceptance of changes in body image during puberty, identity formation, relationships, and personal autonomy. Improper development in these psychosocial areas then prepares a pathway that increases the risk for EDs.

Research does show brain abnormalities in ED patients that may explain these deficits. Though it is not clear whether or not these brain abnormalities existed before the disorder or are an effect of malnutrition, research shows that few of these abnormalities return to normalcy after refeeding, indicating that maybe some brain abnormalities pre-exist to EDs (Lena et al., 2004). However, further research is needed to better understand this relationship.

In short, cognitive deficits are a risk factor for ED development as these deficits may cause abnormal developments in psychosocial and developmental processes, especially during the vulnerable stage of adolescence.

DISCUSSION AND CONCLUSION

In understanding the complexity behind EDs, it is clear that many perspectives must contribute to the discussion of the development and causes of EDs.

This paper covered a few of the many reasons, including some aspects of the social, biological, trait, and cognitive explanations, to contribute to the discussion of ED, specifically AN and BN, development.

SOCIAL

The social explanation was mainly focused on the influences of media and Western culture on the development of EDs, especially in adolescent girls and minority populations. Studies showed that the media, including television, magazines, and websites, have the potential to invoke EDs as well as encourage disordered eating behavior. Exposure to said content and unachievable beauty aesthetics and standards, coupled with genetic predispositions or vulnerabilities, threaten individuals' development of EDs.

Examining the relationship between media and its communication of Western ideals, the Fiji study is an excellent example of how both the media (television) and its content highlighting Western culture and ideals influence the development of EDs (Becker et al., 2018). The study successfully highlights the interplay between media, beauty standards, cultural assimilation, and the development of EDs and disordered eating habits.

The social perspective, particularly the influence of media and Western culture, provides valuable insight into how modernization and globalization have contributed to the increased prevalence of EDs in other cultures, and it forces psychologists to reexamine the definition of EDs as a "Western disorder" in the age of modernization.

BIOLOGICAL

In the biological explanation, I primarily researched hormonal differences between males and females as well as the role of hunger hormones in ED symptomatology as there is insufficient understanding of the genetics behind EDs. Hormonal differences between males and females reveal the different effects of testosterone in males and females; while testosterone has protective abilities against dysregulated eating habits in males, high testosterone levels in females actually induce binge-eating and purging habits. These hormonal differences may explain why EDs disproportionately affect females more than males.

Furthermore, hunger hormones in ED symptomatology provide valuable insight as to how EDs affect the physical human body but also how EDs are a psychological disorder influenced by distorted psychological and cognitive behavior. Unsurprisingly, ghrelin and leptin levels in AN and BN patients are abnormally high and low, respectively, due to ED patients' abnormal eating habits. However, high ghrelin levels, which indicate a lack of fullness, and low leptin levels, which indicate hunger, do not explain why ED patients continue to participate in starvation and binge-purging habits. Thus, further research must be conducted to understand the psychology and decision-making process behind disordered eating behaviors, which are clearly not encouraged by physical feelings of fullness and satiety.

PERSONALITY

The personality explanation acts as an interplay between biological and social perspectives. Studies show that multiple personality traits are present in ED patients and may act as potential “risk factors” for EDs. Traits such as perfectionism and neuroticism predict both AN and BN, but impulsivity is more prevalent in BN patients.

The current understanding behind personality now is that some parts of personality and temperament may be genetically predisposed; however, the development of personalities and their fluidity infer environmental influences on traits. Thus, the interplay between genetics and the environment in personality, and whether or not these traits predict ED diagnoses, deserves further research and development.

COGNITIVE

While symptoms of EDs are manifested physically, the behaviors have psychological and cognitive underpinnings. Research finds that pre-existing cognitive deficits, like attentional, memory, visuospatial, and deficiencies in problem-solving, are present in AN and BN patients. Consequently, these cognitive deficits are potential risk factors and predictive factors for the development of EDs.

A plausible explanation is that these cognitive deficits increase one’s risk of developing low self-esteem, which in turn increases one’s vulnerability to developing an ED. It is unclear if these cognitive deficits directly contribute to the symptoms and behaviors of EDs. However, the evidence that they pre-exist in ED patients makes it valuable as it may lead to potential prevention measures for EDs.

FUTURE DIRECTIONS FOR RESEARCH

A possible direction for future research relates to Miller and Pumariega's study in 2005 on body dissatisfaction in White and Black Americans. Miller and Pumariega's overall consensus is that body dissatisfaction was higher amongst White Americans but is rising in minority populations due to acculturation. I hypothesize that there is a positive correlation between the level of cultural assimilation into American society and body dissatisfaction in Black Americans.

To conduct this research, I would measure the two variables of acculturation and body image. Acculturation will be measured through an identification with the host culture (1 being not at all to 5 being completely) versus identification with native culture (1 being not at all to 5 being completely) (Angelini et al., 2015). Intermarriage with White families would be another distinguishing factor between acculturated and non-acculturated African Americans (Waters and Jiménez, 2005). Body image will be measured with the Body Dissatisfaction Scale (Mutale et al., 2016). The population would target female Black Americans from adolescence to adulthood, from cities all around the United States.

These characteristics are based on previous research to achieve comparative results. I would gather the sample of participants through volunteer sampling as technology and the media's algorithm allows us to target specific populations and backgrounds, creating a more representative sample. Then, I would analyze the data to see if body dissatisfaction correlates with a weaker cultural identity. If the results of the study align with my hypothesis, then it can be concluded that the influence of Western ideals and lifestyles on African American culture relate to higher body dissatisfaction and prevalence of EDs, highlighting the potential negative influence of Western media on minority beauty standards.

Another direction for future research is to examine how EDs are presented under different cultural contexts. Since EDs have long been known to be a Western disorder, I wonder if the prevalence rates in Western nations and low prevalence rates in Asia are due to a misunderstanding of EDs under Eastern or Asian cultural contexts. The target population of this study will be adolescent and young adult women with ED habits, which will be measured with the EAT-26. Distinct cultures will be separated on the basis of different geographical locations; for instance, comparing South Korean women living in South Korea to Americans living in the United States. Next, I will examine the cultural context using the element of way of eating- does the culture emphasize communal eating or do people eat alone more often? Then, I will judge the manifestation of EDs using one ED symptom, that being induced vomiting. I want to examine whether cultural differences lead to different presentations of EDs, even though all participants struggle with a diagnosed ED. If the results show that ED symptoms are manifested differently under different cultural contexts, then it can be inferred that the criteria for ED diagnoses should be re-examined and reevaluated.

Other directions of future research encompass the following goals: to better understand genetic predispositions for the development of EDs and to identify mediating factors or risk factors that make certain individuals more vulnerable to developing EDs. Answering these questions will advance our understanding of how different explanations interact to explain the development and cause of EDs, specifically AN and BN.

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JUDGE'S FEEDBACK:

Sophia excelled in creating a coherent report structure which was well-written and would meet the expectations of undergraduate writing. Throughout the paper she was able to analyse the different biological and social factors at play and how they interacted with one another.

SOPHIA'S TIPS:

- Explore a variety of mediums as part of your research—including traditional journal articles, professional podcasts, documentaries, and more. Incorporating diverse mediums and obtaining perspectives from various sources will allow for an enjoyable research process as well as a more comprehensive understanding of the topic.
- Create an outline of your paper before starting. Oftentimes, your research will expand beyond the scope of your paper. It is important to have a plan for what your paper will highlight and elaborate on so that the content is specific, solid, and organized.
- To maximize the time with your tutor, prepare research, theories, or questions to discuss prior to the meeting. Your tutor is there to guide and collaborate with you; however, they can only help you best in this independent project if you are prepared and engaged in your learning.

Runner Up, Jessie Gaju Mugabo

JESSIE'S BIO:

Jessie is an alumnus of the Immerse Education Online Research Programme in Law. At the time of writing, Jessie was a Grade 11 student at St Stithians Girls' College in Johannesburg, South Africa. Jessie is incredibly passionate about international law and politics. She currently serves as Vice Captain of the school's Model United Nations club. In the future, she aspires to pursue a career in the field of law, politics or international relations.

How has the use of veto power by permanent members of the UN Security Council affected the credibility and effectiveness of the United Nations in addressing humanitarian crises and conflicts? What can be done?

INTRODUCTION:

The United Nations (UN) is an international organization founded in 1945, with 193 member states, whose main purpose is to maintain international peace and security, and increase political and economic cooperation among its member states. The UN plays a crucial role in preventing and responding to humanitarian crises and conflicts. The UN does so through diplomacy, mediation, and peacekeeping efforts, providing humanitarian assistance, including food, shelter, and medical aid, to affected populations in crises and UN peacekeepers help maintain peace and security in conflict zones, facilitating conflict resolution and stability. Additionally, the UN advocates for the protection of civilians and the prevention of human rights abuses, engages in diplomatic efforts to facilitate negotiations between conflicting parties, and collaborates with NGOs and governments to maximize the impact of aid. (7) (9)

The United Nations Security Council (UNSC) has primary responsibility for the maintenance of international peace and security. The UNSC does this through detailed resolutions that stipulate the actions that should be taken in response to a given crisis or conflict.

It has 15 Members, 5 of whom are permanent members (Russia, China, the United Kingdom, France, and the United States), and ten non-permanent members elected for two-year, non consecutive terms by the General Assembly. Under the Charter of the United Nations, all Member States are obligated to comply with Council decisions. (8)

The 5 permanent members of the UNSC have special privileges within the Council, including, most notably, the right to veto resolutions brought forward by other members. Should one of them vote against a draft resolution, it will not pass-regardless of the number of votes by other nations in support of the resolution. This privilege has long been criticised as a major limitation of the UN's effectiveness, due to the cataclysmic impacts of vetoes to some critical resolutions by permanent members in an effort to protect their own nation's interests.

BACKGROUND ON VETO POWER:

The veto power in the United Nations (UN) is a significant feature of its decision-making process, primarily found in the United Nations Charter. When the UN was founded in 1945, the creators of the Charter granted special powers to five permanent security council members: The US, UK, Russia, China and France. According to Oppenheim's International Law: United Nations, "Permanent membership in the Security Council was granted to [these] five states based on their importance in the aftermath of World War II." (12)

Article 27 of the UN Charter outlines the mechanism for the veto power. It states that decisions of the Security Council on non-procedural matters require the concurring votes of all five permanent members. In other words, should one of the P5 members veto a resolution, it will not be adopted.(13).

Article 108 of the UN Charter states that any amendments to the UN Charter, including changes related to the veto power, require the approval of all permanent members of the Security Council, as well as a two-thirds majority vote in the General Assembly. This provision makes any alterations to the current structure of veto power extremely unlikely. (14)

Occasionally, when contentious issues arise, the P5 members may engage in informal negotiations behind closed doors to reach a compromise or avoid a veto. This is known as "P5 diplomacy," and it aims to find common ground among the permanent members.

THEORETICAL FRAMEWORK:

Veto powers within the United Nations can be seen as a mechanism for maintaining great power stability because they provide influential nations with a means to protect their interests and prevent actions that may undermine their security or geopolitical objectives. This can help avoid conflicts among major powers by ensuring that no resolution is passed against their will. Furthermore, veto-wielding countries often play key roles in mediating and facilitating diplomatic negotiations to resolve conflicts. They can use their influence to broker peace agreements and encourage dialogue among conflicting parties.

However, veto powers can also be a major hindrance to effective UN action. Critics argue that veto power grants disproportionate influence to a select group of nations, which can be unfair in a democratic and representative system.

It can hinder the UN's ability to address the needs and concerns of smaller or less powerful countries.

Additionally, in cases of humanitarian emergencies, the use of the veto by a powerful member can obstruct timely interventions, potentially worsening the suffering of affected populations. Finally, repeated use of the veto by major powers, especially in cases that seem to prioritize their own nation's interests over global peace and security, can erode the credibility and legitimacy of the UN as a whole.

In summary, veto powers serve as a tool for maintaining stability among great powers but can hinder the UN's effectiveness in addressing global challenges when used excessively or for selfish purposes. The balance between these two perspectives is a central debate in international diplomacy and calls for UN reform.

Case studies:

1. SYRIA

In March 2011, Syria's government, led by President Bashar al-Assad, faced a significant challenge to its authority when pro-democracy protests emerged, demanding an end to the Assad regime's authoritarian rule in place since 1971. The government responded with violence, employing police, military, and paramilitary forces to suppress demonstrations. Opposition militias emerged in 2011, and by 2012, the situation had escalated into a civil war. (16)

In February 2012, the UN Security Council was considering a draft resolution aimed at addressing the violence and humanitarian crisis in Syria. The resolution was sponsored by several western and Arab countries, and called for president Bashar al-Assad to step down, as well as a transition to a more inclusive government. The resolution received positive votes from all Council members, with the exception of Russia and China.

Russia and China, who were allies of the Assad regime and had strategic interests in Syria. Russia justified their negative vote by arguing that the draft sent a biased signal to Syrian authorities and was overly critical of the Syrian State (11). Russia had also been providing military and diplomatic support to the Syrian government. China also held that "pressuring the Syrian Government for a prejudged result of the dialogue or to impose any solution will not help resolve the Syrian issue." (11)

February 4th 2012, Russia and China exercised their veto power and blocked the resolution. Their veto led to further escalation of the violence, displacement and suffering in Syria.

From 3 February, Syrian security forces began shelling areas in and around Homs in what they claimed was an effort to root out armed resistance groups based there. Those killed include 29 children, and there have been hundreds of injuries. Civilians faced severe food shortages and a lack of adequate treatment for the wounded. And, as in other cities around Syria, fuel supplies were restricted, possibly as a punitive measure. (17)

2. UKRAINE:

Russia's invasion of Ukraine was launched on February 24 2022 (2). "On Friday, September 30th 2022, Russia vetoed a Security Council resolution which describes its attempts to unlawfully annex four regions of Ukraine... as 'a threat to international peace and security' demanding that the decision be immediately and unconditionally reversed." (1)

The draft resolution was co-sponsored by the US and Albania and supported by ten of the fifteen members of the Council. Russia voted against the resolution and there were four abstentions from Brazil, China, Gabon and India. (1)

This annexation by President Vladimir Putin was the biggest in Europe since WWII, and proclaimed Russian rule over 4 regions Luhansk, Donetsk, Kherson and Zaporizhzhya (1)- which make up 15 percent of Ukraine's territory (2)

Linda Thomas-Greenfield, American ambassador to the UN, introduced the resolution that called on member states not to recognise any altered status of Ukraine and obliged Russia to withdraw its troops. (turn into your own words) (2).

"Not a single country voted with Russia. Not one," Thomas-Greenfield told reporters after the meeting, adding that the abstentions "clearly were not a defense of Russia" (2). Russian ambassador to the UN Vassily Nebenzia, who raised his hand to indicate the only vote against the resolution, argued the regions, where Moscow has seized territory by force and where fighting still rages, chose to be part of Russia (2). Ukrainian ambassador to the UN Sergiy Kyslytsya said the single hand raised against the resolution "again testified to Russia's isolation and his desperate attempts to deny reality in our common commitments, starting from the UN charter" (2). The United Kingdom's envoy, Barbara Woodward, stated that Russia had "abused its veto to defend its illegal actions" but said the annexations had " no legal effect". '(2)

3. ISRAEL-PALESTINE

In the early morning of October 7, 2023, Hamas and other armed groups in Gaza launched a coordinated attack on Israel, firing multiple rockets into the country. These groups also infiltrated Israeli territory through land, sea, and air, taking hostages, and inflicting casualties on both Israeli forces and civilians. The situation continued for three days, with the Israeli army regaining control on October 9th. Israel responded with weeks of intense airstrikes in Gaza before expanding the operation into a ground offensive.

On the 8th of December 2023, the United States vetoed a UNSC resolution that called for an immediate humanitarian ceasefire in the war between Israel and Hamas in Gaza (3). Thirteen members of the security council voted in favor of the draft resolution, put forward by the UAE, while the United Kingdom abstained (3).

The vote came after UN Secretary-General Antonio Guterres, invoked the rarely used Article 99 of the UN charter which states that the UN chief "may bring to the attention of the Security Council any matter which in his opinion, may threaten the maintenance of international peace and security." (4). UN Spokesperson Stéphane Dujarric said that this was the first time Mr. Guterres had felt compelled to invoke Chapter 99, since taking office in 2017 (4). Israel and the United States believe that a ceasefire would only benefit Hamas. Robert Wood, US Deputy Ambassador to the UN, stated that an immediate ceasefire "would only plant the seeds for the next war, because Hamas has no desire to see a durable peace, to see a two-state solution" (3). "One hundred and more countries have called for an end to the atrocities. Only one single country did not like that and vetoed the situation. I think this is not wise, this is not acceptable," said Palestinian Authority prime minister, Mohammed Shtayyeh (5).

Oxfam calculated that number of average deaths per day for Gaza is significantly higher than any recent major armed conflict including Syria (96.5 deaths per day), Sudan (51.6), Iraq (50.8), Ukraine (43.9) Afghanistan (23.8) and Yemen (15.8), and according to UNOCHA, there were 23,074 reported deaths in Gaza

between 7 October 23 and 7 January 24 (18). Additionally, 85% of Gaza's population has been driven from their homes. Water, food, electricity and fuel are scarce, with a staggering 80% of the global population facing famine or catastrophic levels of hunger being located in Gaza (19).

Israel's actions against the Palestinian people are in clear violation of the principles of International Humanitarian Law- Namely; precaution, proportionality, and distinction. The principle of proportionality was violated by the scale of Israel's attacks in comparison to the October 7th Hamas attacks, with significantly greater injuries, brutalities and fatalities. Finally, the principle of distinction was violated by Israeli airstrikes on schools and hospitals- neither of which are considered military targets.

On December 29, 2023, South Africa brought a case against Israel at the International Court of Justice (ICJ) over allegations of violations by Israel of its obligations under the 1948 Convention on the Prevention and Punishment of the Crime of Genocide (Genocide Convention). Hearings on South Africa's request for provisional measures were held on the 11th and 12th of January 2024. (22)

To found the jurisdiction of the court, South Africa invoked Article 36, Paragraph 1 of the Statute of the Court, which states that "the jurisdiction of the Court comprises all cases which the parties refer to it and all matters specially provided for in the Charter of the United Nations or in treaties and conventions in force." as well as Article 9 of the Genocide Convention, through which state parties to the Convention can make use of the ICJ as an agency of settling inter-state disputes relating to genocide.

South African justice minister Ronald Lamola stated at the hearing that "the violence and destruction in Palestine and Israel did not begin on the 7th of October 2023." And that Palestinians "have experienced systematic oppression and violence for the last 76 years." Additionally, he stated that "no armed attack on a state territory, no matter how serious, even an attack involving atrocity crimes, can provide any justification for or defense to breaches to the Convention- whether as a matter of law or morality." Israel repeatedly denied that their aggressions toward Palestinians were in fact acts of genocide, frequently citing their integral role in establishing the Genocide Convention post-WWII. Co-agent of Israel, Tal Becker stated that 'the applicant [South Africa] [had] regrettably put before the court a profoundly distorted factual and legal picture', and that 'the entirety of its case hinges on a deliberately curated, decontextualized, and manipulative description of the reality of current hostilities.' (15)

Comparative Analysis:

SIMILARITIES:

In each of these instances, the use of the veto power had severe humanitarian consequences. The vetoes resulted in an escalation of violence and suffering in Syria, Ukraine and the Gaza Strip. In Syria, after the veto, there was increased shelling and violence by government forces, resulting in casualties and displacement. In Ukraine, Russia's annexation of Ukrainian territory was not recognized by the international community, leading to ongoing conflict and instability. In Gaza, thousands more have been killed and the entire population is at risk of famine. Access to humanitarian aid in the region has been very limited, and fuel, electricity and medical care have also been extremely scarce.

DIFFERENCES:

After the veto, Russia faced international isolation in both the Syrian and Ukrainian cases. However, in the Ukraine case, it was particularly notable that no other country supported Russia's position, and the annexations were widely seen as illegal, with many nations not recognising them. The United States has been criticised for its veto
by world leaders, international rights groups as well as UN officials, but currently faces no notable international isolation or legal consequences.

Alternatives and reform proposals:

As it stands, the United Nations faces a dire threat to its effectiveness and credibility due to its evident lack of democracy, jurisdiction and a rules-based system. The jurisdiction of the organization is not universal, as the rules of its various policies and conventions only apply to their signatories, and do not supersede national laws. The only organ of the UN capable of creating binding resolutions, the UNSC, is not remotely universally representative and its special provisions–most notably of veto power–to its 5 permanent members foster an environment in which diplomatic and political relations are more valued than the enforcement of international law, and allow these nations to oppress and escalate violence within smaller nations in an effort to protect their own national interests. As such, the following are reform proposals which would, I believe, improve adherence to international law, by transforming the UN from a highly diplomatic and political system to a more rules based and legal one.

1. RETRACTION OF VETO POWER IN INSTANCES OF MASS ATROCITIES:

In the previously mentioned Ukraine-Russia case, Russia's ability to veto a resolution condemning its actions against Ukraine is concerning. Similarly concerning, is the United States' ability to veto a resolution demanding an immediate humanitarian ceasefire in Gaza, despite the dire humanitarian crisis, due simply to its long-standing diplomatic ties with Israel. The use of veto power by the P5 in cases of mass atrocities, especially if a permanent member is involved in the conflict, should be revoked. Similar reforms have been suggested in the past- since 2015, France has also proposed that the P5 not employ the veto in situations of mass atrocities.

2. EXPANSION OF PERMANENT MEMBERSHIP:

The UNSC's lack of adequate global representation is a significant hindrance to its effectiveness and credibility as an organization. Nations from the Global South make up more than two-thirds of the UN's membership, while the Security Council represents only 8 percent of member states. The only Security Council expansion to date took place in 1965, in the early stages of Africa's decolonization, and, although African conflicts take up over 50 percent of council meetings and 70 percent of its resolutions, no African country has a permanent seat (20). Expansion of permanent membership has been proposed by both the US (20) and France (21), and would allow for accurate representation and fairer decision making within Council.

3. REQUIREMENT FOR PERMANENT MEMBERS TO PROVIDE REASONS FOR THEIR VETO:

This reform has been proposed in the past by Liechtenstein, and would effectively discourage vetoes by permanent members, as they would be reluctant to publicly admit their prioritization of their own national interests, as well as provide other nations with more insight into the reasoning behind vetoes. The validity of their reasoning could then be debated by members of the General Assembly and either approved or rejected by consensus voting.

It is, however, important to note that reform within the UN Security Council is highly unlikely.

This is primarily due Article 108 of the UN Charter, which states that any amendments to the Charter, including changes related to the veto power, require the approval of all permanent members of the Security Council, as well as a two-thirds majority vote in the General Assembly. The likelihood of all permanent members being willing to forgo or limit their right to veto is very low, and thus, debate on this topic is likely to continue.

Conclusion:

Therefore, despite growing concern over the global humanitarian impact of vetoed resolutions, and several proposals for reform by UN member states, the likelihood of the necessary reforms to address these issues remains limited, and thus, so too does the credibility and effectiveness of the United Nations Security Council.

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JUDGE'S FEEDBACK:

Jessie's paper reflected her maturity, which is way beyond her years. This was particularly evident in her writing style, which displayed excellent style, appropriate language and well argued points. Her work in researching key areas such as International Criminal Law and International Human Rights Law benefited her paper, giving it a solid theoretical base and creating an impressive essay.

JESSIE'S TIPS:

- Choose a topic that aligns with your interests. Writing a research paper can be challenging, but it can be an incredibly enriching and engaging experience if you are genuinely interested in the topic.
- Take it step by step. Plan your writing sessions in advance and stick to your schedule. This not only saves you time, but it also makes the writing process much less overwhelming.
- Seek feedback and advice from your tutor consistently throughout writing the essay. This way, you'll be able to fix any errors and make changes early on to ensure you write the best paper you can!

Siti Arifa Zahra

SITI BIO:

Arifa is an alumna of the Biomedical Engineering Online Research Programme. She graduated from Fajar Harapan Senior High School in Banda Aceh in 2024 and is currently pursuing a degree in the Faculty of Civil and Environmental Engineering at Bandung Institute of Technology.

Comparative Analysis of Machine Learning Algorithms in Different Datasets

ABSTRACT

This project investigates the performance of various machine learning models in handling classification tasks within medical data. The study employs Python and scikit-learn, a user-friendly machine learning library, to assess and compare the effectiveness of different classifiers. Conducted on the Google Colab platform, the project utilizes Python as the programming language and scikit-learn as the primary machine learning tool.

The dataset is loaded and split into training and testing sets, with an 80:20 ratio. Different classifiers are applied, and the evaluation metric used is accuracy. This research provides valuable insights into the comparative performance of machine learning models in medical data classification, offering a practical guide for selecting appropriate algorithms in similar applications.

INTRODUCTION

Machine learning is a field of computer science that uses data and algorithms to mimic human learning ability [1]. Machine learning is very important in the field of data science. Machine learning categories fall into three primary categories [1]:

1. SUPERVISED LEARNING

In the face of uncertainty, supervised machine learning develops a model that predicts using the available data. By using a known set of input data and known output responses (responses to the data), a supervised learning algorithm trains a model to produce plausible predictions for the reaction to new data.

2. UNSUPERVISED LEARNING

In artificial intelligence, machine learning that takes place in the absence of human supervision is known as unsupervised learning. Unsupervised machine learning models, in contrast to supervised learning, are given unlabeled data and left to find patterns and insights on their own—without explicit direction or instruction.

3. SEMI-SUPERVISED LEARNING

Semi-supervised learning is a broad category of machine learning techniques that make use of both labeled and unlabeled data; that is, it is a hiybrid approach between supervised and unsupervised learning.
The main idea behind semi-supervision is to treat a datapoint differently depending on whether or not it has a label. If a point has a label, the algorithm updates the model weights using traditional supervision; if it doesn't, it minimizes the difference in predictions between other training examples that are similar to it.

In the context of machine learning, a classifier is an algorithm that automatically sorts or groups data into one or more "classes." An email classifier, which filters emails based on their class label—Spam or Not Spam—is one of the most popular examples. Machine learning algorithms are valuable for automating tasks that were traditionally performed manually. They have the potential to enhance cost and time efficiency significantly. Data analysis is a crucial part of biomedical engineering. different types of data (get ideas from the slides). In this project, we used a dataset from the UCI repository [2].

The aim of this project is to examine the effectiveness of different classifiers in the analysis of medical data. This study's objectives are to first develop a comprehensive understanding of the medical data, which encompasses its attributes, classes, and types. Then, we will implement different classifiers, including k-nearest neighbours, support vector machines, and decision trees, to determine their performance in medical data analysis.

MATERIAL AND METHODS

This section explains the materials and the research method. First the dataset will be explained and then the classifiers that are being implemented will be provided.

1. DATASET

In machine learning, a "dataset" is a collection of information a computer uses to learn from. It is similar to how, for example, a student learns from different subjects in school. One of the most well-known sources for these datasets is the UCI Machine Learning Repository [3]. It is a large online resource of various datasets for different machine-learning tasks.

In this study, we use three famous datasets from the UCI repository:

A. IRIS DATASET:

This dataset is about iris flowers. It includes measurements of 150 iris flowers, focusing on the lengths and widths of their petals and sepals. It's commonly used in machine learning to help computers learn how to classify different species of iris flowers based on these measurements.

B. WINE DATASET:

It contains data about the chemical composition of different drinks, such as hue and colour intensity. This dataset is useful for teaching computers to differentiate between various types of materials based on their chemical properties.

C. BREAST CANCER DATASET:

This dataset provides detailed information about breast cancer characteristics, focusing on the attributes of cell nuclei in breast cancer samples. The task is to distinguish between benign (non-dangerous) and malignant (harmful) cancer cells, which is crucial in medical diagnoses.

Table 1 provides the information of the dataset that are used in this project

Table 1. The details of the dataset; dimensionality, ...

	Number of attributes	Classes	Samples
Iris	4	3	150
Wine	13	3	178
Breast Cancer	30	2	569

2. METHODS

We used Google Colab as the platform for implementing the project. The codes are written in Python, and scikit-learn is used for machine learning implementations. The split (train-test) ratio is 80% to 20%. We used three popular machine learning techniques: k-nearest neighbour, Decision Trees, and Support Vector Machines (SVM).

We decided to evaluate the effectiveness of these techniques by using a metric known as accuracy. Accuracy is a measure of how frequently the method provided the correct solution. This metric is useful in determining which technique is most appropriate for different types of data. This method helped us to make a clear comparison and gain a better understanding of the advantages and disadvantages of each technique.

RESULTS

This section provides the experimental results of implementing the machine learning algorithms on the selected UCI dataset. Table 2 presents the performance metrics of three machine learning algorithms, i.e. k-nearest neighbour, decision trees, and support vector machines - applied to three datasets previously mentioned in Section 2.1.

Table 2. Performance metrics of machine learning algorithms on different datasets

Dataset	K-Nearest Neighbour	Decision Trees	SVM
Iris	1.0	1.0	1.0
Wine	0.805	0.944	0.805
Breast Cancer	0.929	0.947	0.947

The results indicate a perfect score of 1.0 across all three algorithms for the Iris dataset, which is a complete accuracy score. For the Wine dataset, the performance varied: the decision trees method achieved the highest score (0.944), while both k-nearest neighbour and SVM obtained a lower score of 0.805. In the case of the cancer dataset, decision trees and SVM showed similar high performance with a score of 0.947, slightly better than the k-nearest neighbour method, which achieved a score of 0.929.

DISCUSSION

In this project, we have investigated and implemented different machine learning algorithms: k-nearest neighbour, decision trees, and SVM. The experimental results show that the effectiveness of these algorithms varies depending on the dataset parameters. Increasing the number of features in a dataset complicates the classification task. This complexity occurs because the algorithm must consider more factors when making decisions, which can sometimes lead to increased error. The number of classes and the number of samples in a dataset can also impact the performance of the classifiers. The number of samples is also important for performance. Too few samples may not be enough for accurate classification. On the other hand, a large number of samples can improve the learning process. In conclusion, considering these factors is essential for careful dataset selection and preparation in machine learning projects.

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JUDGE'S FEEDBACK:

Siti's project is a clear, well-executed comparison of machine learning classifiers, showing strong understanding and thoughtful dataset selection. Her analysis is accessible yet rigorous, with solid reflections on performance factors.

SITI'S TIPS:

When conducting a research, I begin by selecting a topic that genuinely interests me, ensuring it is focused and well-defined. I establish clear research objectives or questions to maintain direction and seek guidance from my tutor to stay aligned and make informed decisions. I thoroughly review existing studies to understand the context and identify gaps I can address. By using credible sources such as peer-reviewed journals and reliable databases, I ensure my work is well-grounded. Throughout the process, I remain organized, critically analyze my findings, and strive to produce meaningful contributions to the field.

Getting Involved: Steps to Complete an Online Research Project

1

Submit Your Enrolment

Once you have submitted your enrolment and paid a deposit, you will be sent a booking confirmation asking for more information on your academic background and goals.

2

Be Matched With One Of Our Expert Tutors

Using your academic background form, our team will match your profile with one of our expert tutors from Oxford, Cambridge and Ivy League Universities.

3

Receive Your Course Induction Pack

Once we've found your tutor, confirmed your timetable and received your full fees, you will receive final instructions containing details about your programme, such as a course overview, how to access your virtual classroom, as well as any additional material from your tutor.

4

Start Your Course

Choose from a 10 – 20 hours programme with 1:1 tutorials each week. You will also be required to research and prepare your project in your own time.

5

Graduate

At the end of the course, your academic research project will be independently assessed and you will receive a certificate of completion, as well as a detailed evaluation from your tutor.


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