

youthstem

journal club

A Collection of *Literature Reviews* Volume 1 - Summer 2025

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Subject Groups

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Mentor: Jadon Li

Scholars: Aiden Zheng, Allen Zheng, Carter Li, Elsa Deng, Vaibhav Vijaay, Vibha Girish, & Vihaan Vijaay

Computer Science

Mentor: Kalena Dai

Scholars: Aiden Zheng, Akhil Rajdeep, Allen Zheng, Amy Liu, Carter Li, Vaibhav Vijay, & Vihaan Vijay

Neuroscience

Mentor: Jennifer Li

Scholars: Abeera Chaudhary, Asma Chaudhary, Hrishikesh Dronamraju, Kavan Dai, Nuanyi Jin, Sara Rane, & Serena Qu

Mathematics

Mentor: Veer Mahajan

Scholars: Kavan Dai, Rohan Tarun, et al.

Chemistry

Mentor: Ashley Kang

Scholars: Aadhya Somi, Elsa Deng, Leonardo Zhu, Rohan Tarun, Vibha Girish, & Vrishankh Pawar

Psychology

Mentor: Stephanie Leung

Scholars: Andy Lau, Dhritil Vyas, Elsa Deng, & Vibha Girish

Introduction

We are honored to present the first volume of the YSJC Journal, compiled with the literature reviews written by students in our six subject groups on various scientific papers. Over the course of the Summer 2025 term, the students have engaged in guided discussions, learned how to dissect and interpret research, and completed a capstone project, consisting of a literature review paper and a final presentation. This journal showcases their curiosity, critical thinking, and commitment to understanding complex scientific topics, serving as a celebration of their hard work.

Group briefings

Biology: The YSJC Biology team focused on investigating the mechanisms across different biological layers that determine the resilience of an ecosystem, helping students understand how ecosystems resist and recover from perturbations.

Mathematics: YSJC Mathematics considered methods of modeling random networks using complex topology, though we also dealt with practical applications of modular arithmetic and matrices within cryptography. Our literature review provides key insights and a discussion of the paper “Emergence of Scaling in Random Networks.”

Computer science: This summer, YSJC Computer Science explored the foundations of modern artificial intelligence by examining the paper “Attention Is All You Need.” Through our literature review, we discussed the parts of transformer models, including attention, embedding, and backpropagation, which revolutionized language processing.

Neuroscience: The neuroscience group concentrated on learning about the cognition behind memory through two studies: one that uncovered insights in memory loss, and one that explored the creation of memories. Students learned about the mechanisms of the brain and wrote literature reviews presenting and analyzing each paper.

Psychology: This summer, YSJC Psychology focused on exploring sensation & perception, as well as social psychology. Our literature review is a critical analysis and modern day connection of Milgram’s obedience study.

Chemistry: Over the past four weeks, the Chemistry Group centered our discussions around various real world applications of the field, primarily studying heavy metal detection and atmospheric water harvesting. Through mini-lectures, group activities, and literature review, students learned about the importance of these technologies in addressing current environmental and industrial challenges, and gained practical experience in scientific analysis and teamwork.

YSJC BIOLOGY

Literature Review: *Understanding and applying biological resilience, from genes to ecosystems*

By Aiden Zheng, Allen Zheng, Carter Li, Elsa Deng, Jadon Li, Vaibhav Vijaay, Vibha Girish, & Vihaan Vijaay

In their article "Understanding and applying biological resilience, from genes to ecosystems," Thorogood, Mustonen, et al. (2024), explore significant environmental challenges facing our planet. Major problems identified include habitat destruction, invasive species, pollution, population issues, climate change, and overexploitation. These major problems make an impact on all of the biological levels. For example, invasive species may have an impact on the community part of the biological levels because of competition for resources and a predatory advantage.

The central question the authors address is, "Why can some species, communities, or ecosystems persist and adapt through disturbances while others can't?" (Thorogood et al., 2024, p. 1). To explore this, the authors introduce the concept of biological resilience, defined as an ecosystem's ability to resist and recover from perturbations. Factors contributing to strong biological resilience include high genetic diversity, the capability to remember and learn from past experiences, and the ability to adapt and evolve. Evolutionary memory helps the species "prepare" for a future disturbance, while plasticity allows changes to an organism's phenotype, causing more genetic diversity thus increasing the species' ability to buffer disturbances.

The review defines several key concepts clearly. Resistance is described as an ecosystem's ability to withstand disturbances without significant functional changes. Recovery involves repairing a degraded ecosystem to restore its functionality and health. Plasticity refers to an organism's ability to alter its physical characteristics or behaviors in response to environmental changes. Additionally, a distinction is drawn between disturbance and perturbation. Disturbance is a disruptive event that causes significant and lasting changes, such as deforestation, while a perturbation is the resulting effect of the disturbance, like habitat loss and loss of wildlife.

In this study, surveyors used Long Term Surveys, Big Data, Modeling simulations, Experimental Perturbations and Natural Experiments. Long term surveys are surveys that span over long periods of time. They work by repeatedly collecting data from one unvarying group of subjects. Big data is a large amount of data generated from digital interactions. It can detect patterns and trends in results. Modeling and simulations create a digital representation of a system to gather data. Experimental Perturbations are artificial perturbations introduced to a natural system to gather data real-time. These four methodologies help surveyors gather information on ecological systems (Thorogood et al., 2024, p. 6-7).

The authors using reductionist approaches to focus on individual biological levels which helps make things clearer and easier to handle, emphasize that resilience operates at various biological levels including ecosystems/communities, populations/organisms, cells/organelles, and genomes/genes. The past eco-evolutionary history of a species plays a crucial role in its current ability to handle environmental challenges. Encountering similar issues historically can lead to genetic adaptations that enhance resilience in the present, as natural selection favors better adapted species over time (Thorogood et al., 2024, p. 2).

To illustrate cross-level resilience, the example of salmon is discussed. Overfishing, a disturbance decreasing salmon populations, negatively impacted capelin as well, as it causes the population to increase due to reduced predation. There is also less food and resources available to the capelin population because of the significant increase in the capelin population. This goes to demonstrate

interconnectedness across biological levels. Genetic changes in salmon's adipocyte production exemplify how gene-level alterations can influence organism-level resilience (Thorogood et al., 2024, p. 8).

Several testable hypotheses are presented to advance scientific understanding of resilience. The first hypothesis suggests past experiences help animals to adapt to future disturbances, illustrated by songbirds altering their songs based on temperature. The second hypothesis suggests that greater diversity increases future ecosystem resilience, supported by ecological memory. The third hypothesis proposes that adaptation to current disturbances could reduce future resilience, shown by how trees adapt to humidity changes (Thorogood et al., 2024, p. 7).

We observed a local ecosystem, Lake Elizabeth. Although there was a lot of evidence of human activity, there was plenty of vegetation in the area. There were many paved paths, buildings, people, and signs of drought. One area we focused on that had strong resilience was Duck Island, as it is isolated from human activity and is a place where many birds and animals seek refuge. However, there are some withered plants around paths and other places with lots of humans. Two major stressors we identified are paved surfaces and human activity. Paved paths reduce efficient animal movement, decrease available habitats, and make genetic adaptations such as sturdier paws or feet necessary. Human activity may disrupt natural hunting behaviors, increase dependency on human-provided food, cause cellular-level harm from pollution, and prompt genetic adaptations like improved immunity to pollutants. However, these adaptations cannot happen within a few generations of a species, so to apply biological resilience and recovery to the Lake Elizabeth ecosystem, it is vital to stop animal feeding, install fountains to reduce water stagnation, reduce paved paths, reduce litter, and create protected areas for wildlife regeneration.

The main takeaway is that multiple factors across different biological layers affect an ecosystem's resilience and response to perturbations. This understanding has practical applications in management and conservation, such as studying forest regeneration after fires to enhance future resilience and conservation strategies. A question remains regarding how an ecosystem with weak biological resilience begins to deteriorate and collapse when unable to recover from perturbations.

YSJC COMPUTER SCIENCE

Literature Review: *Attention is All You Need*

By Aiden Zheng, Akhil Rajdeep, Allen Zheng, Amy Liu, Carter Li, Vaibhav Vijay, & Vihaan Vijay

“Attention Is All You Need”, written by researchers at Google and the University of Toronto, Ashish Vaswani, Noam Shazeer, Niki Parmar, Jacob Uszkoreit, Llion Jones, Aidan N. Gomez, Lukasz Kaiser, and Ilia Polokushin, introduces a new way for computers to recognize and process human language. Before this paper, most computer systems used recurrent networks to process the given sentence by each given word. Recurrent neural networks, long short-term memory and gated recurrent neural networks are some types of more primitive and less developed AI, or artificial intelligence. While these versions of AI work, they are not ideal, and are not very reliable in terms of accuracy. The recurrent networks were slow, and models had difficulties with longer sentences. This paper proposes a fully different method called “Attention”.

This study outlines how attention in transformers work. The researchers listed out the steps in an encoder-decoder structure: embedding, scaled dot-product attention, feed forward networks, and back propagation, steps needed for the transformer to work. One of the steps, specifically the scaled dot-product attention, uses queries and keys to determine the relevance of a word to the meanings of other words in the sentence. The result of this is a better working AI, surpassing RNNs, LSTMs, and other less powerful AI models. Self attention is favorable because of its computation power and complexity.

Transformers determine how much attention each part of the input gets by using queries, keys and values. The first step is to match the queries with the keys. For example, in the sentence “She ate the cake.” We match the word “ate” with other words in the sentence by using dot products. Dot products tell how similar words are. The larger the dot product, the more similar the two words are. For example in the “She ate the cake” example, “ate” and “cake” would have a very large number representing the dot product. Then we scale the dot product by square rooting it, and then use a softmax, squishing the value. The paper teaches us the usefulness of attention in transformers compared to RNNs and LSTMs. This matters because RNNs and other networks struggle a lot with remembering information from a while back. Which means that transformers have a deeper understanding of the context. And this can lead to creations of better LLMs. Most well known AI models these days use transformers. For example, the GPT series (one to four), Google’s Gemini, BERT and countless other AI models.

Back propagation is really important and it helps computers learn from their mistakes. It helps improve neural networks which allows it to get better over time by going back through the hidden layers. It goes back through the hidden layers to see which neurons had incorrect numbers and then it adjusts the weights and biases. For example, back propagation is similar to how a teacher corrects you in class. The teacher helps you by going back and seeing what's wrong and going step by step to help you through it. The summarization for back propagation is the following. Step 1 is to guess the answer to the question you received. Step 2 is to check how wrong the answer to the question was. Step 3 is check what you got wrong and fix the error. Step 4 is to try again with a better guess to the question.

Thus, with these improvements, transformers take a lot less time to train compared to other neural networks, and have a higher performance and efficiency. However, transformers aren’t perfect. They compare every word in a sentence to other words, so if there is a long text or video they have to summarize, it would be really hard for the transformer. Even though transformers are very powerful, they also need a lot of data to train themselves. And lessening the data used to train the transformer would mean that the model won’t be able to do a lot of tasks. This research is pretty significant because it

showed how the old and popular neural networks like RNNs and LSTMs could all be replaced by transformers. Some implications are that transformers led to new AI models such as ChatGPT. This research about attention shows how if we just focus on attention, this can improve AI models and can lead them to better understanding of language.

The Transformers model was a new model made to solve the constraint of sequential computation. It uses attention to determine the importance of words, which allows it to focus on the most relevant parts. In the WMT 2014 English to German and English to French translation tasks, the Transformer achieved state of the art and surpassed all other AI models. The Transformer model used attention to determine the importance of words, and was a very successful large language model that significantly improved AI. Conclusively, this paper focuses on the application of attention in the embedding process of LLMs, how the process functions, and why it's notable. The authors described the 4 steps to embedding and how attention plays a major role in the process. Overall, the emphasis on attention highlights a shift in AI towards models that process information more efficiently, paving the way for more powerful and efficient models in the future.

YSJC NEUROSCIENCE

Literature Review 1: *Loss of Recent Memory After Bilateral Hippocampal Lesions*

By Abeera Chaudhary, Asma Chaudhary, Hrishikesh Dronamraju,
Nuanyi Jin, & Serena Qu

Despite being fundamental to human cognition, memory remained one of the least understood brain functions in the mid-20th century, an era without MRI or other advanced technologies. The paper “Loss of Recent Memory After Bilateral Hippocampal Lesions,” written in 1957 by William Scoville and Brenda Milner, is a landmark study that revealed key insights about the neurological basis of memory and is one of the most important studies in the field of neuroscience. In their experiment, the authors investigated why patients like Henry Molaison (Patient H.M.) were experiencing seizures, psychotic symptoms and other brain-related illnesses, through a surgical approach involving the removal of his hippocampus. This groundbreaking operation led to discoveries that revolutionized our understanding of memory, and the discoveries yielded from it changed the field of neuroscience forever.

To understand this study, it is helpful to consider some background information. At the time, there was not much known about mental illnesses or the different roles of parts of the brain. This led doctors to perform invasive procedures such as lobotomies, or removing parts of the brain, to try and cure disorders like epilepsy or bipolar disorder. However, the hippocampus actually plays a crucial role in memory, which is much more significant than previously thought. Additionally, there are many distinct types of memory within the more general short and long-term branches, such as working memory, which is used when one does mental math; semantic memory, the long-term memory of facts, concepts, and language; and episodic memory, which is memory used to recall significant events or moments (Going to a place for the first time) that you experienced. Some key terminology in this paper is anterograde amnesia, a condition in which a person can't form new memories but remembers previous memories before surgery; medial temporal lobe (MTL), a brain lobe which includes the hippocampus; and bilateral, which means on both sides of something.

In their experiment, scientists lesioned the patients' MTL and hippocampus, then observed their behaviors and conducted psychiatric assessments of their personalities, intelligence, memory. In the surgery, they removed the hippocampus and amygdala. Patient H.M.'s seizures stopped, but he unexpectedly developed anterograde amnesia, meaning he could no longer form new memories. He retained long-term semantic and episodic memories, but only had an effective working (short-term) memory after his surgery, suggesting that damage to the hippocampus impairs memory. The most important patient in this study is H.M., but others were also included in the paper who had varying levels of neurological problems, who had no changes in personality or IQ, but were similarly unable to form any new memories due to anterograde amnesia after the surgery.

There are a few notable takeaways from this paper. First, the hippocampus plays a significant role in memory by sending new short-term memories for permanent long-term storage. Furthermore, the more of the MTL that is destroyed, the more severe the amnesia is. The operation raised a substantial ethical concern about brain surgeries, particularly those that are as invasive as removing an entire part of the brain. This case highlighted the importance of informed consent and the risks of radical brain surgeries as well as that mental illnesses should not be treated with invasive brain surgeries like lobotomies.

This paper marked a turning point in neuroscience and neuroanatomy. However, it faces some limitations. Some shortcomings are that the procedures and content described in the paper are slightly outdated, as it was published in 1957. Further, since it is largely centered around a case study, not all the

results can be generalized. While some conclusions may be limited by the technology and understanding of the time, this study is still very useful because without it, we wouldn't know the crucial role that the hippocampus plays in making and consolidating new memories. Despite its age, the paper is relatively accessible and provides foundational knowledge about the hippocampus and memory, illustrating that every part of the brain is important, and defining the basics of today's modern neuroscience.

Literature Review 2: *Creating a False Memory in the Hippocampus*

By Abeera Chaudhary, Asma Chaudhary, Hrishikesh Dronamraju, Kavan Dai, Nuanyi Jin, Sara Rane,
& Serena Qu

False memories can form when the brain fills in gaps in memory, often due to sleep deprivation, hallucinations, or the brain's innate tendency to construct coherent narratives. However, the deliberate creation of artificial false memories remained largely unexplored until the 2013 study "Creating a False Memory in the Hippocampus" by Steve Ramirez et al. In this experiment, the scientists investigated whether they could find a memory in the brain and manipulate it, and whether it was possible to alter memories using light. The scientists employed optogenetics, a specialized technique in which brain cells are activated and deactivated with light, enabling them to "turn on" a memory and investigate whether a false fear memory could be created. They identified specific memory engrams, which are neurons that control a specific memory. To activate the memories using light, they used a light-sensitive protein called channel rhodopsin, which acted like an "on-off" switch for the engram. Through its findings, this study paved the way for a modern understanding of the constructive and vulnerable nature of memory.

The researchers conducted this study by using mice as model organisms. By inserting a light-sensitive protein called channel rhodopsin-2 into the dentate gyrus of a mouse using a virus, they were able to create a light switch to control the brain. Using this switch, they could activate specific memories. To test this, scientists placed mice into two distinct environments, labeled Context A and Context B. Context A was a safe environment with no stressors. However, in Context B, the mice were given a foot shock when exploring the box while the memory from Context A was activated. They were then placed into box A, where they displayed freezing behavior, indicating that they felt fear despite never being shocked in Context A. This demonstrates that the mice had formed a false memory based on the optogenetic reactivation of Context A while in Context B.

The study effectively conveyed how memories are encoded and retrieved in the brain, providing novel insight on how it can be manipulated. It had a strong experimental design, with each part of the experiment serving a clear purpose, helping to demonstrate the results accurately. On the other hand, the experiment was not as effective in defining more complicated concepts. Although the diagrams appear modern, they can still be somewhat difficult to understand, especially for those unfamiliar with optogenetics and how the brain works.

This experiment is important to the field of neuroscience as it shows that memories can be altered and changed. It also opens up more exploration into optogenetics, a field usually dismissed in the past, and shines a spotlight on memory creation and the ethical risks behind it if it is used in human minds. The experiment also rewrote what memory was, and it helped neuroscientists discover more about the brain, explaining in detail how memories can be edited and how fake memories are formed. This provides more information on memory for neurologists and can be useful in the future, opening up new possibilities.

YSJC MATHEMATICS

Literature Review: *Emergence of Scaling in Random Networks*

By Kavan Dai, Rohan Tarun, Veer Mahajan, et al.

The research paper “Emergence of Scaling in Random Networks”, led by researchers Albert-Laszlo Barabasi and Reka Albert of the University of Notre-Dame’s Physics Department, focused on finding a suitable and accurate model for random networks, including the internet and social networks. In doing so, they challenged existing models by incorporating two new facets, previously ignored in network models using complex topology, namely exponential growth and preferential attachment. These were believed to be necessary for the emergence of scale-free random networks, a proposition that was later mathematically proven by the researchers. Furthermore, this research also discovered that the growth and preferential attachment in these models of random networks is independent of time, implying networks are characterized as Self-organizing.

The primary goal of the study was to answer the question of how to model random networks and to identify the key characteristics thereof. Modeling random networks is essential for better understanding the large systems around us, including biological, economic, and social systems, as well as the World Wide Web itself. In order to implement a better model, the researchers considered previously taken approaches to analyze their shortcomings. Pairing this newfound knowledge of gaps and holes with more accessible data, they were able to identify two new governing rules - the growth of networks over time and preferential treatment in edge selections between vertices (similar to the widely observed “rich get richer” phenomenon). In the end, the research found that common among the various systems observed were scale-free distributions and power-law-obeying patterns (where $P(k) \sim k^{-\gamma}$ and $P(k)$ is the probability of a vertex having k edges).

The paper showed that random networks organize themselves through growth and preferential attachment, thereby forming scale-free power-law distributions. Barabasi and Albert demonstrated that using the popular Erdos and Renyi theory is neither applicable nor accurate, as it neglects two key characteristics of real random networks (the aforementioned preferential attachment and expansion). However, there may be an even better representation of these complex, random networks, employing characteristics the authors themselves did not include, meaning this is not a definitive solution. Though this paper isn’t conclusive, it has helped foster a greater understanding of models and their workings. Additionally, the paper assumed linear preferential attachment. At the same time, other cases are explained away as not leading to scaling; there is more work that can be done to address these cases. Suppose preferential attachment (PA) is modeled by $\Pi(k)$; then, linear PA is modeled by $\Pi(k) \sim k$, while nonlinear, exponential PA is modeled by $\Pi(k) \sim k^\alpha$, and more generic α , $\alpha \neq 1$ forms of PA are given by $\Pi(k) \sim m(k)$, where m may follow a damped oscillation pattern, for instance.

Furthermore, the authors believe these findings may be applied to an even more vast array of networks, including those for which there is still very little data available. The broad applicability is another important consideration; these models can be used to enhance humanity’s understanding of genetic, biological, socioeconomic, and a host of other types of networks. In summary, random networks like the World Wide Web are self-organizing and follow scale-free power-law distributions subject to constraints of growth and PA. These are widely applicable to a variety of models, ranging from genetics and heredity to airports and connections therein.

YSJC CHEMISTRY

Literature Review: *Occurrence, exposure, and health risk assessment of heavy metals in green tea samples cultivated in the Hangzhou area*

By Aadhya Somi, Elsa Deng, Leonardo Zhu, Rohan Tarun, Vibha Girish, & Vrishankh Pawar

In their research study “Occurrence, exposure, and health risk assessment of heavy metals in green tea samples cultivated in the Hangzhou area,” Jicai Fan, Shuting Wang, Like Gong, Ren Ren, and Quan Jin examined the implications of heavy metals in green tea samples. Standing as the second most popular beverage in the world, tea is known for its numerous health benefits; however, the presence of heavy metals in the drink has made the health effects of tea a cause for concern. Heavy metals can be very dangerous to the human body, bioaccumulating over time and potentially causing nerve, kidney, and bone diseases. After conducting multiple experiments and comparing the heavy metal concentrations with regulatory limits, the study concluded the tea was safe for consumption, posing no significant health risks.

This study employed 120 samples from a variety of sources throughout the Hangzhou area, all pretreated in capped tubes. Afterwards, the researchers used a process known as an inductively coupled plasma-mass spectrometer, or ICP-MS for short, to determine the concentration of heavy metals. Most heavy metals had a 100% detection rate, except for mercury, antimony, selenium, and tin. The researchers found that Manganese (Mn) was the most common heavy metal out of the 15 studied, appearing 100% of the time and having a concentration between 202.00 and 2010.00 mg/kg and a mean of 830.00 mg/kg. Meanwhile, the least common heavy metal was Mercury (Hg), appearing only 69.2% of the time with a concentration ranging from ND to 0.017 mg/kg and a mean of 0.0033 mg/kg. All of the 120 samples tested didn’t exceed the limit for the concentration of heavy metals, as the concentration was 0.7 on the Hazard Index (HI), indicating that the tea in the Hangzhou area was safe to drink.

There are many strengths in this well-thought-out paper, one of them being the comprehensive element analysis. Fifteen different heavy metals (e.g., Hg, Al, Sn, etc.) were studied using ICP-MS, which focuses on high precision and sensitivity. The tea was also sampled from a variety of places across the Hangzhou districts, giving the data more reliability. Although the study does not pose many weaknesses, there were a few factors that could have been taken into account throughout the study. Among them is the season, which could have provided more insight into whether the concentration of heavy metals in green tea is stimulated by different temperatures or seasonal variability.

In conclusion, researchers studied green tea from Hangzhou to gauge the presence of heavy metals, which can be considerably harmful if there is too large of a concentration present. They tested 120 samples using a scientific method called ICP-MS and found that none of the tea samples surpassed the safety limits. The pollution levels were very low, with scores well below 0.7, indicating the tea is considered clean and safe. They also studied whether drinking the tea could pose a risk for people’s health and found that the risk level (HI value) was only 0.42, suggesting drinking this green tea is not likely to be harmful to health. Ultimately, this study provides valuable evidence that, despite the detectable presence of various heavy metals, green tea from the Hangzhou area remains within established safety limits.

YSJC PSYCHOLOGY

Literature Review: *Milgram's Obedience Study*

By Andy Lau, Dhritil Vyas, Elsa Deng, & Vibha Girish

The Milgram study was a monumental study in psychology history, shrouded in controversy and ethical concerns. It was inspired by the atrocities committed in World War II, when people could not believe how ordinary humans could inflict such torture on others. How could those people obey such a ruthless dictator like Hitler? In 1961, Stanley Milgram set out to find the answer.

The study had experimenters act as teachers, who would announce spelling words. When an actor (Who was in on the experiment) “accidentally” spelled the word wrong, the teacher would tell the clueless participant to send a shock to the actor. Even though the shocks administered were fake, the participants did not know. When the participants did not want to go on with the study, an experimenter would “prod” them, telling them to go on. If the participant refused further, they would be deemed disobedient. After the experiment ended, the results were shocking; 65% of the participants gave the most lethal shock. Even the most pessimistic of researchers estimated only about 3% would go this far. This meant that people could be swayed by simple authority figures to do things previously unimaginable to them. The study also had another effect on psychology, namely, ethical standards. The tension between the subjects had also caused uncontrollable seizures, which were dangerous to the participant's health. As a result, the American Psychological Association increased the transparency of psychology experiments to ensure that no such events occurred again. This was a checkpoint in psychology, boosting the ethical standards of psychology experiments and bringing them to the more humane conditions we know today.

The Milgram study worked hard to eliminate any bias, such as the participants realizing the shock machines were fake or that the person getting shocked was just an actor. However, the participants had entered through a newspaper ad, which was a flaw in the project. Because the experimenter offered 4 dollars to participants, there was a chance that a specific group of people had accidentally been targeted, such as the unemployed. Although not verified, unemployed individuals may have been more susceptible to hurting others for their gain. This is much like the TV show “Squid Games”, where players would kill others for their own gain, like 456 billion dollars. Here, players hurt others because they are forced to.

In conclusion, the Milgram study was a controversial study performed on many participants, many of whom were mentally distressed after the study. The Milgram study caused the Psychology ethical standards to be raised to prevent future distress coming from psychology studies. Nonetheless, it was a pivotal change in which we see humans now, and will never be forgotten in Psychology history.

To conclude this journal, we would like to acknowledge all the individuals and communities who made this effort possible.

To all the students, thank you for your dedication to learning, your diligence throughout the program, and your intellectual curiosity. Your thoughtful engagement and contributions have been greatly impressive and inspiring. We hope you carry forward the knowledge you've gained here, continue to pursue your scientific passions, and find success and fulfillment in your prospective paths.

To the parents and guardians, we are grateful for your support, encouragement, time, and commitment to your students' growth.

We deeply appreciate the support and efforts of everyone involved to bring this opportunity to life, and we wish you all the best in your future endeavors.

Best,
YSJC Team

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