

---

# Exploring Perceptions of Positive and Negative Impacts of Students' Well-Being on Their Physical Health

Mikayla Voets<sup>1</sup>, Emily Bergsma<sup>1</sup>, Kayla Zanon<sup>1</sup>, Jacob Thomas<sup>1</sup>, Keeley McGrath<sup>1</sup>

## Abstract

With thousands of students attending university every year, little research has been conducted to assess whether there are positive or negative impacts of students' well-being on their physical health. Using a qualitative online survey, we anonymously sampled McMaster University undergraduate students (n=45) which consisted of female (n=31) and male (n=12) participants. Our survey included questions such as: what is your satisfaction with your physical health and well-being, what activities do you associate with positive and negative well-being, what is your perceived level of stress throughout the school year, and how do you cope with stressful situations? Through a series of coding and identifying categorical variables, we analyzed our data by drawing on themes that related our research. This revealed relationships between students' well-being and physical health, allowing us to make positive and negative correlations between well-being and physical health and compare them in their relation to university, in order to reveal the effects they have on each other. We found that 73.3% of participants are "unsatisfied" with their well-being and 44.4% of participants are "unsatisfied" with their physical health. As well, 53.3% of students reveal that their level of stress increases during the school year, however most responses indicated positive word associations with the terms well-being and physical health, but negative word associations with the term university. Our research concluded that one's well-being has serious implications on physical health, demonstrating that declining well-being can directly impact the physical health of university students.

## Introduction

### Topic of Research

In today's world, mental health and well-being is discussed more than ever before. As society works hard at fighting away the stigma surrounding mental illness, new conversations are brought forward, thus leading to new understandings. With new findings, the beginnings of critical conversations, and the reduction in stigma surrounding mental well-being, we are able to see an enormous correlation between well-being and physical health. The idea that mental health and well-being can have relations to one's physical health can be dated back to the 5th century BCE. Greek medicine, at this time, believed in a physiological explanation for mental disorders through the humoral theory

---

<sup>1</sup> Undergraduate Student, Honours Social Psychology Program, Faculty of Social Sciences, McMaster University, Hamilton, Ontario, Canada.

(Chakravarty, 2011). Specifically, the humoral theory considered the body as being “composed of four humours: blood, phlegm, yellow bile, and black bile” (Chakravarty, 2011, 269). Furthermore, mental disorders were seen as a cause of imbalance of black bile in the body (Chakravarty, 2011); taking this concept of body imbalance causing problems of well-being, we seek to further understand how in modern society the connection between well-being and physiology still exists. This study will provide a relationship between mental well-being and physical health, and the effects university has on these aspects in an individual's life. We also hope to provide insight to universities allowing them to understand the impacts the culture and institution can have on its students' well-being and physiology.

### **Purpose of Research**

We sought to explore and understand this relationship between physical health and well-being, noting the importance of prior research in this subject, and where there can be further or additional knowledge found. When examining the well-being of university students, it is vital to consider each and every facet of mental well-being and physical health, and more importantly the onset of physical health problems as a result of well-being. Noted by Ghazal Read et al. (2016), there has been extensive research done on both mental health and physical health individually; however, there has been a paucity of research on the correlation between both mental and physical health. Through the literature we studied, it was practical to assume physical activity improves well-being; one underlying aim our research sought to provide was the opposing view - does one's well-being have implications of exercising (Hayes & Ross, 1986). Furthermore, we took this knowledge and applied it to university students and expanded by looking at the effects well-being (i.e., perceived stress, happiness, body image, etc.) can take on individuals' physical health. The study took a social psychological context by applying the influence of a larger institution, university and its social culture, and connected it to individual experiences of well-being and physical health to determine the impacts it may have on one's life.

Taking into consideration the theory of cognitive dissonance it is understood that if two or more concepts in the brain are inconsistent, individuals will seek to change the inconsistency to better align (become more consistent) (Festinger, 1962). If this concept is applied to the components of an individual's well-being and physical health, it can be anticipated that there is consistency between the two. Thus, when applying cognitive dissonance to well-being there may be evidence displaying physical health behaviour being impacted by whether someone has good versus poor well-being.

### **Research Questions**

Throughout the course of our research, the primary focus has been to understand the connection between emotional and physical well-being. The research of this study was conducted solely online via LimeSurvey, and only included participants in their undergrad at McMaster University. We believe this allowed a look into the lived experiences and perceptions these students have on physical health and mental well-being in relation to university as a contributing factor.

In summation, there is literature that establishes connections between physical health and well-being and can be seen dating back to the classical Greek era. However, there

is still room for growth in knowledge of this subject matter which we have attempted to cover: (1) Does one's state of well-being have implications on aspects of physical health - i.e. exercising?; (2) In which ways does being a university student impact this relationship of well-being and physiology?; (3) Does the relationship between well-being and physical health appear different among different self-identified genders, and in which ways - physiology/well-being, or both? Ultimately, the aim of this study is to explore perceptions of positive and negative impacts of students' well-being on their physical health.

### **Overview**

This following research study is divided into six significant sections. The first section provides a review of previous literature pertaining to our topic. The literature review works to solidify our research, as well as show how our research fills the gaps that current studies have failed to address. We will then outline the theoretical frameworks used in our research study including 'Cognitive Dissonance' and 'Attribution Theory. We utilize these theories to understand the adverse correlation between emotional and physical well-being, as well as provide an explanation connecting these theoretical assumptions to our research. Following this, we will discuss our methodology, including an outline of the research methodology, ethical considerations, the research process, and an analysis of the data. This section includes a step-by-step review of the research process from start to finish, as well as an in-depth consideration of ethical concerns from our research. It will also provide a detailed overview of the data analysis component. Next, we will share the results of our research. We will then discuss our findings, including a comprehensive analysis and interpretation of the results, as well as assert the broader significance of our research. Lastly, we will conclude with a summary of our overall findings. This will also provide insight into any possible limitations of our research study. Additionally, we will conclude with significant insights and contributions that our research grants to the McMaster community and undergraduate students alike.

### **Literature Review**

The following section reviews previous literature that has been published on the correlation between physical exercise/health and mental well-being.

### **Review of Previous Literature**

Soo Kim, Soo Park, Allegrante, Marks, Ok, Ok Cho, & Garber (2012) investigated the relationship between physical activity and general mental health in the United States. The purpose of their study was to determine an ideal number of hours an individual should engage in physical exercise per week to provide the greatest benefits to their mental health (Soo Kim et al., 2012). Their goal was to prove a dose-response relationship between physical activity and mental well-being, meaning they were trying to determine the proper dose of physical exercise in order to have a positive outcome on mental well-being. (Soo Kim et al., 2012). They examined over 7500 responses from a national U.S health survey that questioned adults on their general health and time spent on physical leisure per week. The authors discovered that between 2.5 to 7.5 hours of physical activity per week showed to be the most optimal range, proving their hypothesis of a dose response relationship (Soo Kim et al., 2012). Furthermore, the authors found that an

overexertion of exercise could result in a loss of the perceived mental health benefits associated with physical activity (Soo Kim et al., 2012).

The association between physical exercise and mental well-being was further researched by Graaf, Ten Have and Monshouwer (2011). The authors conducted a longitudinal study on the length of time individuals spent on physical exercise and how it is associated with mental disorders (Graaf et al., 2011). Using data from a mental health survey from the Netherlands, the authors found that those who are more active are, on average, of a higher socioeconomic status and are less likely to have a somatic illness (Graaf et al., 2011). Furthermore, the authors noted that an excess amount of physical exercise could prove to be just as negative towards one's mental health as zero physical exercise. They also noted that engaging in physical activity translated into a better course of mental illness and boosted recovery rates. Finally, they concluded that physical exercise is correlated with lower likelihood of mental disorders and better mental health (Ten Have et al., 2011).

Adams, Dye and Moore (2007) analyzed both vigorous and strength training, among female college students. They chose to study this as a result of the lack of research on the topic with a younger demographic of participants and also because mental illness is more prevalent in females. A seven-day frequency of either strength training or vigorous/moderate cardiovascular exercise was presented to groups of individuals and they answered questions on the duration of either activity (Adams et al., 2007). Participants were then asked questions regarding their mental well-being such as self-reported anxiety and overall perceived health (Adams et al., 2007). The authors discovered strength training to be more correlated with positive mental health than the vigorous cardiovascular training. The authors concluded that a relationship exists between physical exercise and mental health; however, more research is needed before physical activity is to be promoted as a type of treatment for mental illness (Adams et al., 2007).

Hayes and Ross (1986) examined two perspectives on the relationship between the physical and psychological aspects of oneself. The two main perspectives considered within this study were social evaluation and internal processes which allowed researchers to examine how external factors such as societal attitudes may impact one's psychological well-being, as well as how the relationship between psychological and physical health may impact well-being (Hayes & Ross, 1986). The purpose of this research was to determine whether variables such as being overweight, exercise, and general physical health were more heavily impacted by societal expectations or the internal processes that occur within an individual's body (Hayes & Ross, 1986). The researchers also wanted to determine the implications that these variables may place on an individual's overall well-being. Overall, this study found that exercising and having overall good physical health directly improved psychological well-being (Hayes et al., 1986). The authors also noted that being overweight did not have either a positive or negative implication on well-being, despite the negative stigma surrounding the topic that is maintained within society.

When analyzing the relationship between psychological well-being and physical health, it is important to consider variables such as age when conducting research. Ohrnberger, Fichera, & Sutton (2017) explored the effects that social capital and lifestyle choices such as cigarette smoking and physical activity placed on the relationship between physical

and mental health in an older age demographic. This study was conducted on a group of 10,693 individuals who were aged over 50 years old via a six-wave longitudinal study which ranged from 2002 to 2012 (Ohrnberger, Fichera, & Sutton, 2017). The most significant finding within this study was that both the participant's past mental health and past physical health had strong, indirect cross-effects on the participant's current mental and physical health (Ohrnberger et al., 2017). This was demonstrated in the finding that individuals who previously had better mental health were likely to decrease their cigarette consumption over time, presenting a positive outcome on their physical health in later life (Ohrnberger et al., 2017). It is expected that our research will similarly reflect this finding.

It is evident that there is a distinct relationship between physical and mental health. This relationship was further analyzed in the study conducted by Herbert, Meixner, Wiebking, & Gilg, (2020). This study was conducted among 185 university students in a laboratory study. The goal of this study was to determine how various rates of physical activity impacted mental health and well-being (Herbert, Meixner, Wiebking, & Gilg, 2020). Specifically, this study analyzed levels of both general perceived stress and perceived stress due to uncertainty of the future regarding finances, jobs, and social relationships. The main finding of this study determined that there is a strong relationship between physical activity and mental health among this group of university students (Herbert et al., 2020). In the group of participants that participated in a 6 week-long aerobic exercise program, there were significant reductions in perceived stress in all areas. This finding highlights that the psychological well-being of students may be directly improved if they incorporate low to moderate physical activity in their daily schedules (Herbert et al., 2020). It is expected that participants within our research study that incorporate a form of physical activity into their daily lives will have a more positive perception of their psychological well-being.

### **Analysis of Previous Literature**

There are many common themes throughout the articles chosen for this literature review. One of these themes is the study design with both Graaf et al. (2011) and Ohrnberger et al. (2017) using a longitudinal design for their research. Although both studies focused on rather different aspects of the relationship between physical activity and mental wellness, their findings echoed similar results. Both studies saw that the effects of either mental health or physical exercise lasted far into one's future, with past habits reflecting into their health years later. This demonstrates the benefits of a longitudinal study, and how this particular design allows for exploration into branches of research that are not possible with less time-consuming designs.

Several findings throughout multiple articles shared similar results. Particularly interesting was the finding that too much exercise can diminish the number of positive impacts seen on mental health. Soo Kim et al. (2012) and Graaf et al. (2011) both briefly touched upon this during their discussion. Additionally, Herbert et al. (2020) also claimed that through their study, they concluded that low to moderate physical activity is the best way to maintain positive mental well-being, rather than vigorous, high intensity physical activity. However, none of the other articles mentioned a possible upper limit to physical exercise. This is notable and begs the question of why no other researchers from our chosen articles discovered this. We may consider this finding when approaching our research.

Two of the articles directly research post-secondary students: university and college level (Adams et al., 2007 & Herbert et al., 2020). These studies are a great resource for the purpose of our research as this previous research was conducted on a similar demographic as ours will be conducted upon. The article published by Herbert et al. (2020) especially stood out to us because throughout their research, they took certain variables into account such as social relationships, jobs, and finances. We believe this is significantly important to the population we are choosing to study as these variables are so extremely present in the minds of university students. They could be struggling to afford their tuition and having difficulty picking a career path, all while trying to find a balance of having social life. Both research studies found evidence of a relationship between mental health and physical activity, as did all the articles in the literature review (Adams et al., 2007 & Herbert et al., 2020). However, we wonder if there may be a stronger link between the two variables in certain demographics, as none of the selected articles address this. For example, post-secondary students, compared to an opposing group, such as adults working full time jobs. This could be something that future studies surrounding this topic could consider in their research.

When considering the impact of an individual's psychological well-being on their health, topics such as societal attitudes and social comparison are commonly considered during research. Specifically, both Hayes et al. (1986) and Herbert et al. (2020) analyzed societal attitudes surrounding general perceptions of physical health and societal attitudes during their research studies. Although both studies considered these topics, it is important to consider how results may vary due to differences in social evaluations and attitudes depending on the demographic of participants chosen. For example, demographic variables such as socioeconomic status, gender, and the age of participants may produce differences in the responses that they submit. Although these studies provided an adequate analysis of these variables, they may place a larger impact on data collected than the previous studies may have reflected. Individuals who are a part of the McMaster community come from a variety of places and backgrounds, leading to greater diversity and variation within these demographic variables. For example, individuals that were raised in varying levels of socioeconomic status may not have the same opportunities as their peers to focus on their psychological well-being or physical health. Some of these opportunities may include access to counselling and therapy, extra-curricular activities, as well as gym memberships. These differences may be something that the research we conduct will more significantly reflect due to the large amount of diversity that is seen within the McMaster community.

### **Limitations of Previous Literature**

Across all the articles analyzed, there were multiple limitations present within each study that was conducted. One of the most prominent limitations that may have impacted all these studies was that only a small number of mediators rather than a larger or more open range were considered. For example, many articles considered variables such as age, income, and religion while completing their studies and further involved these variables in their analysis of the results. Although some studies included additional variables such as gender, education level, and socioeconomic status in their demographic questions, very few included these variables in their discussion. We understand that this may not have been relevant to their studies, nonetheless they have the potential to be an

important mediator in the way of analysis. Another limitation that must be considered across all studies is that well-being is a subjective concept, and that each individual will rate their well-being differently depending on their interpretations of the concept.

It is important to consider the demographic being studied when conducting research. Specifically, it is important to consider how different age cohorts of people may answer or interpret survey questions differently. These differences may arise due to how their initial understanding of a topic was developed, depending on societal attitudes surrounding the topic during a critical point of the creation of their development. For example, the participants in the article were a very young demographic whereas in the research study, participants were found to be significantly older. This is an important limitation to consider when comparing these pieces of literature because definitions of psychological well-being have changed drastically over time and are much less contested compared to the times that older generations may have grown up in. Additionally, it is important to consider individual differences in physical health as well. A limitation that may arise surrounding this issue is that physical health varies per person, and both exercise and physical activity impact each individual differently. It is also important to consider that the participants surveyed may have varying levels of physical health due to things such as income, socioeconomic status, and age.

Lastly, it is difficult to compare the findings of these studies as each study utilized a different theoretical perspective to analyze their results. These theories may have changed how researchers interpreted the data that was collected, as well as what information they decided to include for their studies.

### **Theory**

Within this study, social psychological theoretical concepts will be applied and examined when considering the potential positive or negative impacts on students' well-being, and the effect this may have on their physical health. The first theory being considered within this study is cognitive dissonance. Cognitive dissonance refers to a situational conflict in which there is an inconsistency between two or more cognitive elements (Festinger, 1962). For example, when an individual chooses to smoke, despite having the knowledge that smoking causes cancer. The act of smoking is considered the behaviour and the knowledge of causing cancer is the cognition.

When an individual experiences cognitive dissonance, it is often accompanied by a feeling of mental discomfort, which then motivates the individual to alternate their attitudes, beliefs, or behaviours to restore balance within their cognitions. In addition, Leon Festinger (1962) is the first theorist to have investigated cognitive dissonance and suggests that humans have an innate need to maintain harmony among conflicting attitudes and behaviours in order to avoid disharmony or 'dissonance'. This theory also states that cognitive dissonance usually occurs in two situational frameworks, one occurring after a decision has been made, which is referred to as post-decisional dissonance, and the other being when one acts in a way that is inconsistent with their own beliefs, known as counter-attitudinal behaviour (Festinger, 1962). Our intention to make decisions that benefit our personal needs and desires do not develop easily, thus it is necessary to reflect on the factors that influence these situation-based decisions, in order to understand the ways in which they affect us.

Consequently, when examining our research topic, one would consider how an individual's well-being can have an impact on their physical health, perhaps leading to cognitive dissonance. This theory helps us frame our research in the following way: when one has negative attitudes or thoughts it could potentially result in poor physical health, meaning that a poor state of well-being would be considered the cognition, and the lack of care in regard to physical health would be the behaviour. In terms of results, it may become evident that individuals with poor well-being may act in ways that decrease the quality of their mental and physical health, similar to individuals who have a good well-being and appear to intentionally act in ways that increase the quality of their physical health.

Another aspect of cognitive dissonance related to our research is whether a poor state of well-being causing discomfort may potentially motivate the individual to make positive changes in alternating their attitudes in order to improve their well-being and physical health. Utilizing the framework of cognitive dissonance within the research will also give us the opportunity to review different states of cognition that impact our physical health through the results of the survey. The most evident factor between cognitive dissonance and our research topic is Festinger's (1962) belief that humans have a distinct need to avoid dissonance among their cognitions. This research has the potential to reflect on the universal desire to be happy and how this factor affects us as humans when we do not meet the ideal standards of happiness (well-being), resulting in poor physical health (Festinger, 1962). In comparison, one's positive cognitions and their positive effects on an individual's physical health will be reviewed in comparison to cognitive dissonance.

Furthermore, this research will also consider attribution theory. Attribution theory refers to the process in which an observer uses to infer the causes of another individual's behaviour (Festinger, 1962). For example, one may attribute an individual feeling of being sad or upset to a loved one passing away. Fritz Heider (1958) was the first theorist to propose a psychological theory of attribution and develop the terms of situational (external) and dispositional (internal) attributions as part of the theory's framework. Situational attributions explain behaviour by focusing on factors in the person's social environment (Heider, 1958), however dispositional attributions explain behaviour by looking within the person (Heider, 1958).

Nevertheless, Heider (1958) was not the only theorist to expand on attribution theory. F. W. Schneider (2012) explored attribution theory through the notion of attribution biases and errors. Schneider (2012) stated that people tend to overestimate others' behaviours and underestimate the influence of external factors on one's actions, referring to this concept as the fundamental attribution error (Heider, 1958). External factors may also be referred to as social influences which shape people's attitudes and behaviours based on the demands of their social group. Similarly, Harold Kelley (1967) expanded on Heider's (1958) attribution theory by introducing the covariation model. The covariation model seeks to explain how individuals arrive at these attributions and the factors that influence their inferences (Kelley, 1967). In doing so, Kelley (1967) identified three factors that influence attributions, consensus, consistency, and distinctiveness. Consensus takes into account whether or not others behave the same in a similar situation; whereas consistency looks at whether the individual themselves continuously behaves the same way in a particular situation; further, distinctiveness considers whether the individual behaves the same in similar situations (Kelley, 1967).



The notion that attributions are not fixed but vary situationally, allows for a greater perspective in assessing the dynamic of students' well-being and the contributing factors that affect their physical health, as our research may reveal. In addition, applying the concept of fundamental attribution error within attribution theory to our research is imperative to understanding how social influences affect individuals' behaviours and well-being. This research has the potential to find a correlation between negative social influences resulting in poor well-being and physical health. For example, if a student associates themselves with a group of peers who constantly feel stressed about school, this could result in poor well-being for the individual themselves. Therefore, it would be reasonable to attribute the social influence of stress to neglecting one's physical health. As a result, attribution theory will prove to be effective in that the data itself will contain a variation of students' statuses of well-being and will allow us as researchers to associate situational influences on particular states of physical health.

## Methodology

### Research Methodology

Through quantitative measures, we have conducted an anonymous survey via online. From our research, we found useful data that helps to gain knowledge of university students' lived experiences with well-being and physical health. Additionally, we sought to find correlations of positive and negative effects students' wellbeing have on their physical health through asking a series of questions around well-being and physical health. This quantitative anonymous online survey included both closed (Likert scale) and open-ended questions. It was important that the participants remained anonymous, so we utilized LimeSurvey, an anonymous online survey that was approved through ethics, and is specific to Canada (Clancy, 2020). Additionally, it should be noted that the research was approved by the McMaster Research Ethics Board (MREB#: 0327).

We were able to gain insightful data from a total of 45 participants, including female (n=31) and male (n=12) participants, within the undergraduate population at McMaster University located in Ontario, Canada. We made use of a non-probability sample, also known as a convenience sample. This method of sampling was practical as our research was on a smaller scale and the participants were obtained through particular groups within us, the researchers' knowledge (Robson, 2014). For our research specifically, we pursued McMaster University clubs and organizations for participants. Snowball sampling was also utilized as our participants from the non-probability sample group may have personally known of others who were interested in participating (Robson, 2014). Through these recruitment methods, we were able to gain enough participants to receive sufficient data.

### Ethical Issues

As mentioned by Robson (2014), ethical concerns are always present when people are involved in a research study; Robson (2014: 74) however notes, "there is little point to research involving people if it doesn't have the potential to affect someone in some way." Although it was not the intent for people to be impacted negatively from their participation in our survey, it was important to consider possible breaches of ethics that could have arisen. As we asked personal questions revolving around well-being and physical health, there posed potential psychological risks. These risks may have been

subjective to the individuals participating, including feelings of embarrassment, weariness, or upset (as noted in our section of “Ethics Protocol”). In addition, there was the potential of social risks associated with fear of privacy or reputation being tarnished for those who participated. Although there were both social and psychological risks, we ensured that they posed no risks greater than those in everyday.

Considering the potential risks associated with having participated in our survey, we implemented procedures to ensure ethical research was conducted. First, it is important to note all participants were provided with a letter of information in order for them to make an informed decision and following this letter they had to give consent to proceed further (Clancy, 2020). With these steps in place, participants were given a chance to understand our research and what their participation entailed, as well, gave them the opportunity to change their mind. Additionally, at any point during the survey, up until they submitted the survey, participants had the opportunity to no longer participate - also noted in the letter of information. Furthermore, the information received was submitted anonymously, allowing them to secure their anonymity and privacy over the course of the research. All data collected was confidential in secure data storage software to further keep data private. Furthermore, we had also provided contact information for McMaster’s Student Wellness Centre as a preventative measure and risk mitigation strategy. Although potential psychological and social risks may have been involved in our research, the overarching data collected has appeared as beneficial, and we hope through the actions we had put in place participants felt comfortable and safe.

### **Research Process**

Through recruitment, we were able to find willing participants to take part in our survey. Our plan of recruitment involved posting within McMaster affiliated Facebook pages/groups and emailing McMaster student lead organizations. When emailing the different contacts, we provided our recruitment scripts and our letter of information. We obtained permission for posting by emailing or messaging administrators of Facebook groups given ethics approval; we provided an overview of what our research was, and how individuals could participate. Once approved by the administrator we would then either post our recruitment script or have the administrator post on our behalf. We began by approaching these communities through cohorts, only continuing to expand based on the number of participants had received; noting each particular group we had contacted. The associations we contacted include; McMaster Social Science Society (MSSS), Social Psychology Society, Anthropology Society, Economics Society, Geography and Earth Sciences Society, Health and Aging Society Association, Labour Studies Student Association, Political Sciences Student Association, PNB Society, SCaRs, Social Work Student Collective, Sociology Society, Life Sciences Society, Engineering Society, DeGroot School of Business Society, Humanities Society, McMaster Women’s Flag Football Club, McMaster Dance Team, Class of 2021 - McMaster University - Official, Class of 2022 - McMaster University, Class of 2023 - McMaster University - Official Orientation, Class of 2024 - McMaster University - Official Group, McMaster Student Union, McMaster University - Current Students, McMaster Linguistics Society, Spotted at Mac. It was our goal through approaching different societies and graduating years that we would be able to get a diverse representation of McMaster’s undergraduate population.

Keeley McGrath, Emily Bergsma, and Jacob Thomas were the individuals responsible for contacting previously noted groups. Emily Bergsma specifically was in charge of contacting the MSSS and Social Psychology society; as both Keeley McGrath and Jacob Thomas had past connections with said groups. Mikayla Voets was also noted as a conflict of interest as she had attachments to multiple groups including; MSSS, Social Psychology Society, McMaster Women's Football, and Class of 2024 students through means of a teaching assistant position, thus we concluded to exclude her in the recruitment reach out.

We also shared our poster of recruitment to reach a larger audience, in replacement of not displaying a recruitment poster throughout campus. The poster clearly stated that we were seeking willing participants for a research study and included the title of our study and a brief description, including the approximate time commitment to complete the survey (10-15 minutes), as well as providing Jacob Thomas' email address for contact, and lastly, a link to our survey.

Our survey consisted of 27 questions including both open-ended and closed-ended to optimize insight. Once granted permission through ethics approval, we conducted data collection through the LimeSurvey platform (an anonymous survey approved through MREB). This survey was conducted online and completed anonymously. The questions involved an assortment including; Likert scales, demographic, multiple and single choice, and open-ended. We were able to collect data from a total of 45 participants. We coded the received data in themes of physical health, academics, and well-being, then further coded using perceived positive and negative attributes to responses. Through this initial coding we were able to draw relevant connections between these themes in order to develop relationships and influences that they had to one another. We then were able to draw conclusions, and conduct graphs to help display the data received. Chosen results were then displayed as a poster presentation using bar and pie graphs, it also recorded the premise of our research, our demographic, methods used, significant insights, and a general conclusion. Finally, we have gone into further detail to outline our research and findings within this final thesis research paper.

## **Data Analysis**

After we closed our survey on February 12, 2021, we began our data analysis. It is important to understand the concept of coding when discussing our analysis. Coding, as explained by Robson (2014), is the process of categorizing data into themes that hold significant meaning to the research. As previously mentioned, we planned to start with a simple categorization including: physical health, university, well-being, and gender. Due to the lack of representation in different genders (approx. 69% self-identified as female) we were not able to gain significant data to draw connections on gender differences. However, from the other categories we were able to expand, developing a total of 11 different thematic categories, specifically used to code the open-ended questions from the survey. We began with the coding themes of physical health, mental well-being, and university. From there we added codes of positive; positive physical health; positive mental well-being; positive, university; negative; negative physical health; negative mental well-being; and negative, university. Data was able to be categorized in either one or more of these codes, allowing us to derive connections to overarching ideas and findings. Specifically, it allowed us to draw relationships between well-being and physical

health, in which we could then apply the theme of university separately to see the influence it held.

Furthermore, through using coding we were able to give quantitative value through categorical variables. Categorical variables refer to numbers given to different categories (Robson, 2014). For our research specifically, some categories had been a result of our coding (i.e. through open-ended questions in survey), and others were given numerical value pre-emptively. For example, in questions such as “How satisfied are you with your physical health?”, numerical value was given through use of a Likert scale. With this analysis we were able to account for frequency and make comparisons specific to things like university and stress. When recording and calculating this data we used software including PSPP and Microsoft Excel. This allowed us to easily convert data into graphs and better display our findings. Additionally, the PSPP data editor was used to complete cross tabulations of our data for the purpose of finding deeper connections between results.

We made use of a series of bar graphs and pie charts to show correlations found and make comparisons of different variables. Overall, we were able to make positive and negative correlations between mental well-being and physical health; and could then compare these correlations in relation to university to develop effects they have on one another.

### **Methodology Summary**

Overall, through using quantitative measures we were able to gain insight into the connection between physical health and mental well-being specifically within university students through having conducted an online survey consisting of open and closed-ended questions. Participants were recruited through non-probability sampling, while also noting the potential use of snowball sampling. Although there were potential risks and conflicts of interest, we made sure to address these issues and made use of ethical mitigation tactics to avoid these issues. We used recruitment posters and scripts to provide clear and accurate information on our study to any of the potential participants. By providing all the necessary information we were able to assume implied consent and gave the opportunity for participants to skip any question they did not wish to answer. We made use of self-coding, Word Excel and PSPP to analyze our data, as well as created graphs and tables of our variables to aid our discussion and insights. Lastly, we drew connections between our variables to help support our overall conclusion of our study.

## **Results**

### **Demographics**

We asked participants of our survey to answer multiple demographic questions including: employment status, age, gender and year of undergraduate education. Our final total sample size was 45 McMaster university students (n=45).

### **Employment Status**

The majority of our participants were part-time employees, with a total of 42.2% (n=19) selecting this category. Closely following this category was employed, with 37.8% (n=17) of the participants fitting into this category. These results are not uncommon, because being a full-time university student does not allow for a lot of extra time to have a job.

13.3% (n=6) of respondents reported that they were casually employed, and 6.7% (n=3) selected that they were working in full time employment. The following results are shown in Figure 1.

**Figure 1**

*Frequency Table – Employment Status*

<b>What is your employment status?</b>	<b>Frequency</b>
Unemployed	17
Casually employed	6
Part-time employed	19
Full-time employed	3
	n=45

**Age**

The overwhelming majority of the participants were 21 years of age, a total of 60%. Following this category, the second most selected answer was 20, with 24.4% of the respondents choosing this age group. Age 22 and age 19 were both selected only 4.4% of the time, and age 18 and age 24 were only selected 2.2% of the time. There was also one non-response to this question, leading to a total of 45 participants. These results could be interpreted to mean that the individuals who completed our survey were likely mostly third years and fourth years. This is exactly what was demonstrated in the last demographic question. The results of the age distribution are shown in Figure 2.

**Figure 2**

*Frequency Table – Age*

<b>What is your age?</b>	<b>Frequency</b>
18	1
19	2
20	11
21	27
22	2

23	1
	n=45

### **Gender**

In order to remain inclusive, gender was programmed as an open-ended question. This allowed for participants to type in their own answer rather than having to select one. We witnessed a huge gap between male and female participants, with 68.8% of respondents being female, and only 26.7% of respondents being male. There was also one non-response to this question. These results can be seen in Figure 3.

### **Figure 3**

*Frequency Table – Gender*

<b>What gender do you identify as?</b>	<b>Frequency</b>
Female	31
Male	12
N/A	1
	n=45

### **Year of Undergraduate**

The final demographic question that was asked was on what year of undergraduate education the participants were in. As predicted by the responses to the demographic question of age, the majority of participants were in Fourth/Fifth year, precisely 57.8% responded this way. Third year was the second most selected answer, with 31.1% of our sample selecting this answer. Second year students only represented 4.4% of the sample, and there was only one first year student to complete the survey (2.2%). There were also 2 non-responses (4.4%), which is shown in Figure 4.

### **Figure 4**

*Frequency Table – Year of Undergraduate*

<b>What year of undergraduate are you in?</b>	<b>Frequency</b>
Fourth/Fifth Year	26
Third Year	14
Second Year	2

First Year	1
N/A	2
	n= 45

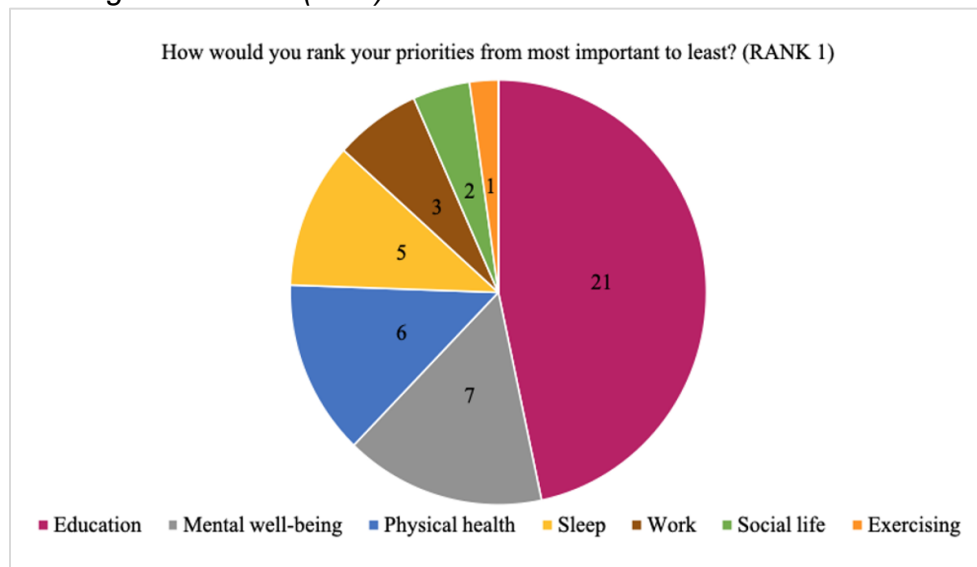
## Analysis of Variables

### Ranking of Priorities

The first question on our survey asked individuals to rank their priorities from most important to least. The options they were given included: education, work, physical health, mental well-being, sleep, water intake, volunteering, social life and exercising. Our results showed that education was ranked as the top priority 46.7% of the time. Additionally, water intake and volunteering were ranked first 0% of the time. The results of Rank 1 can be seen in a pie graph in Figure 5. Running cross tabulations with the PSPP Data Editor showed that out of the 21 participants who selected education as their first priority, 76.2% of them selected 'unsatisfied' when asked about the perceived satisfaction of students' mental well-being. The other 23.8% selected 'very unsatisfied' when asked this question, meaning that none of individuals who selected education as a first priority believed that most university students were satisfied with their mental well-being. In addition to this, out of the 6 individuals who selected physical health as a first priority, 5 of them still selected 'unsatisfied' with perceived well-being, and only 1 selected 'satisfied'. Further, the results showed that volunteering was ranked last 60% of the time and that education, mental well-being, physical health, and water intake were never selected last as a priority. The results of Rank 9 can be seen in Figure 6.

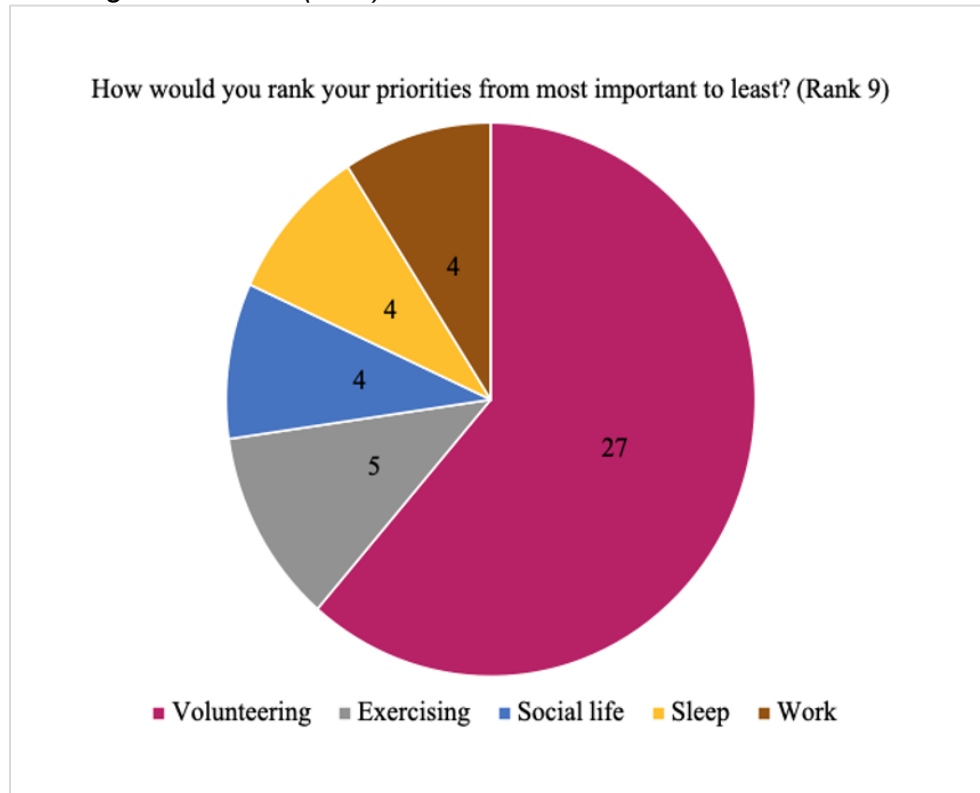
### Figure 5

#### Ranking of Priorities (First)



Note. 'Water intake' and 'volunteering' are missing from this graph because they were never ranked as first.

**Figure 6**  
*Ranking of Priorities (Last)*



Note. 'Education', 'mental well-being', 'physical health' & 'water intake' are missing from this graph because they were never ranked as last.

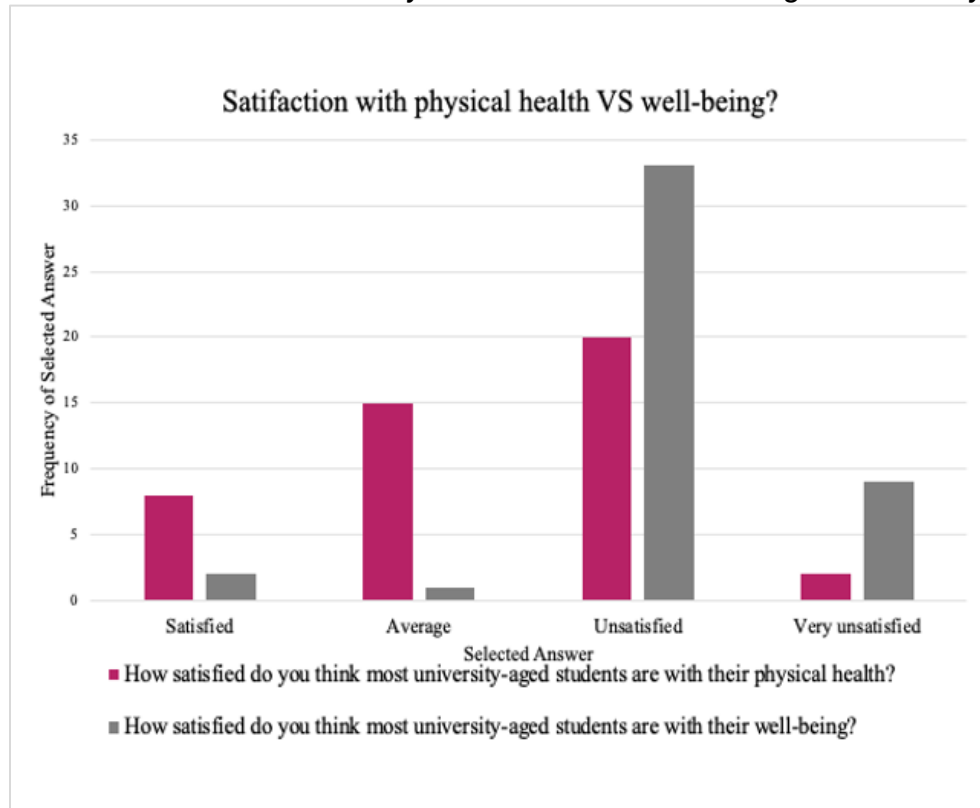
### **Satisfaction With Physical Health VS. Well-Being**

Results from the questions asked on 'perceived satisfaction with mental well-being' and perceived satisfaction with physical well-being' showed significantly negative results. In particular, 73.3% of respondents chose 'unsatisfied' in regard to university aged students' satisfaction with mental well-being. Another 20% of respondents chose 'very unsatisfied', meaning that only 6.7% of the overall sample selected 'average' or 'satisfied'. When asked about university aged students perceived level of satisfaction of physical health, the results were not as negative, but we still witnessed more 'unsatisfied' answers than expected. Of the participants 44.4% selected 'unsatisfied' and an additional 4.4% selected 'very unsatisfied'. A total of 33.3% of respondents believe that most university aged students were 'average'(ly) satisfied with their physical health, and the remaining 17.9% selected 'satisfied'. A cross tabulation test showed that those who selected 'unsatisfied' for mental well-being (n=33) were almost just as likely to select 'unsatisfied' or 'average' when asked about physical health. Furthermore, 39.4% of those who selected 'unsatisfied' for mental well-being also selected 'unsatisfied' for physical health. Additionally, 36.4% of those who selected 'unsatisfied' for mental well-being selected 'average' for physical health, just a 3% difference between the two. However, only 21.2%% selected 'satisfied' for physical health if they selected 'unsatisfied' for mental well-being. These results clearly demonstrate a connection between physical health and mental well-being. A comparison of these results can be viewed in Figure 7.



## Figure 7

### *Perceived Satisfaction of Physical Health vs. Well-Being in University Aged Students*



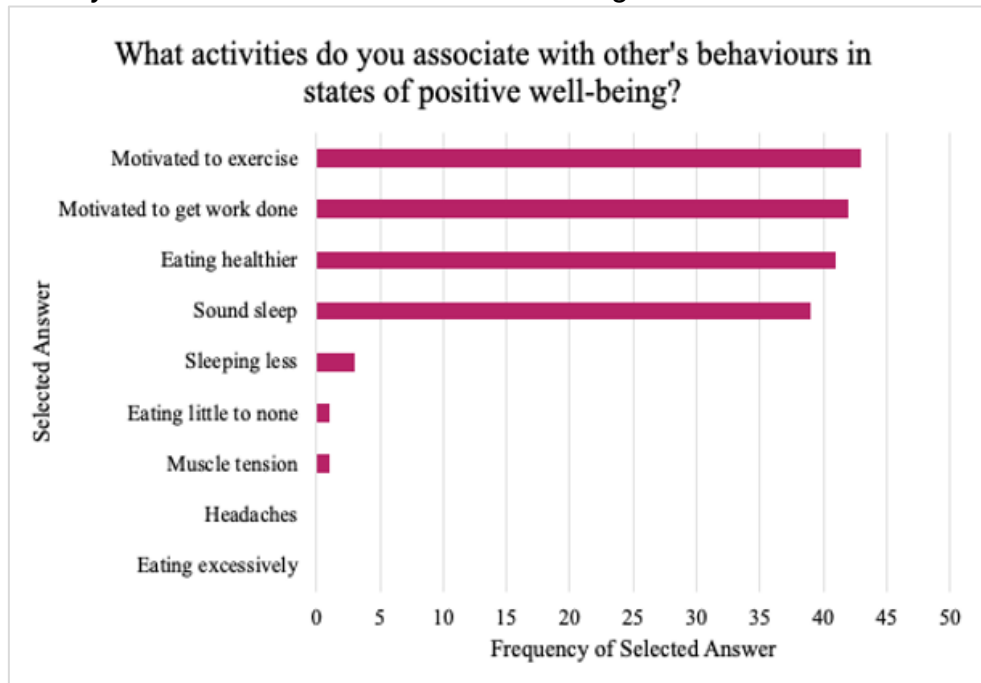
### ***Influence on Working Out/Getting Physical Exercise***

We asked our participants which reason they believe to have the greatest impact on working out/getting physical exercise and results show almost a split; 57.8% selected 'to enhance well-being and outlook' and 42.2% selected 'societal pressures or influence'. We would have liked to see more select the first option; however, these results show the reality of our world today. A connection can then be made about how the process of working out can influence one's mental well-being if they are doing it for society rather than for themselves.

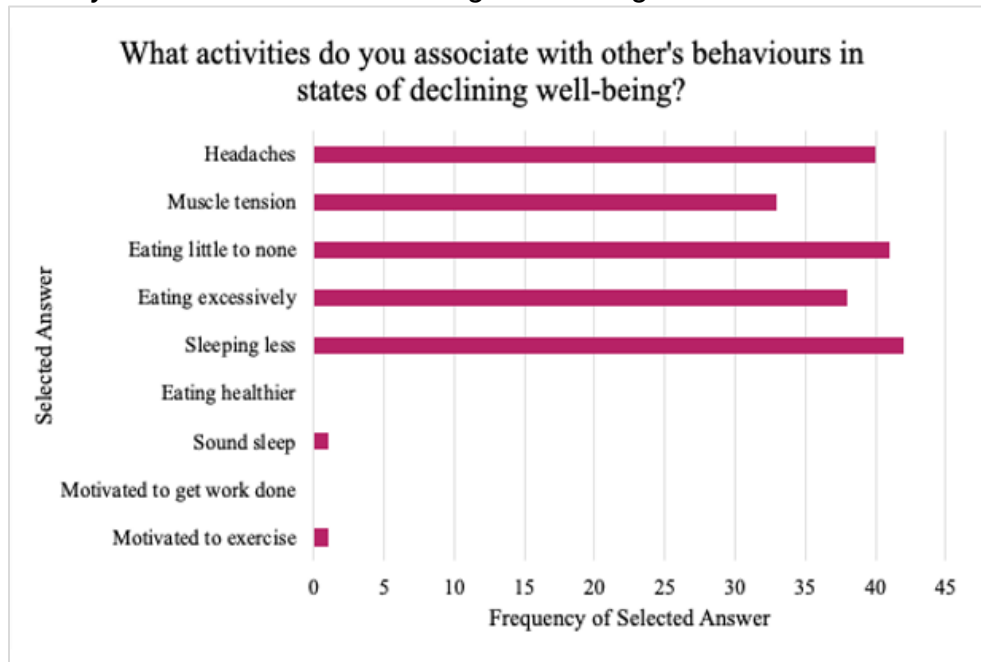
### ***Activity Association With Positive Well-Being VS. Declining Well-Being***

Two of the questions on our survey were dedicated to asking individuals what activities they associate with others in states of positive mental well-being, and declining mental well-being. In states of positive well-being, 'motivated to exercise' was selected the most, with 43 out of 45 overall participants agreeing that this is an activity associated with positive mental well-being. These results, shown in Figure 8, clearly work to prove our hypothesis, as do the results of activity association with states of declining mental well-being, shown in Figure 9. The most selected answer was 'sleeping less', with 42 out of 45 participants making this connection. More importantly, 'headaches' and 'muscle tension' were selected by the large majority of participants, therefore showing a direct connection between physical health and mental well-being.

**Figure 8**  
*Activity Association with Positive Well-Being*



**Figure 9**  
*Activity Association with Declining Well-Being*



**Amount of Exercise/Amount of Sleep**

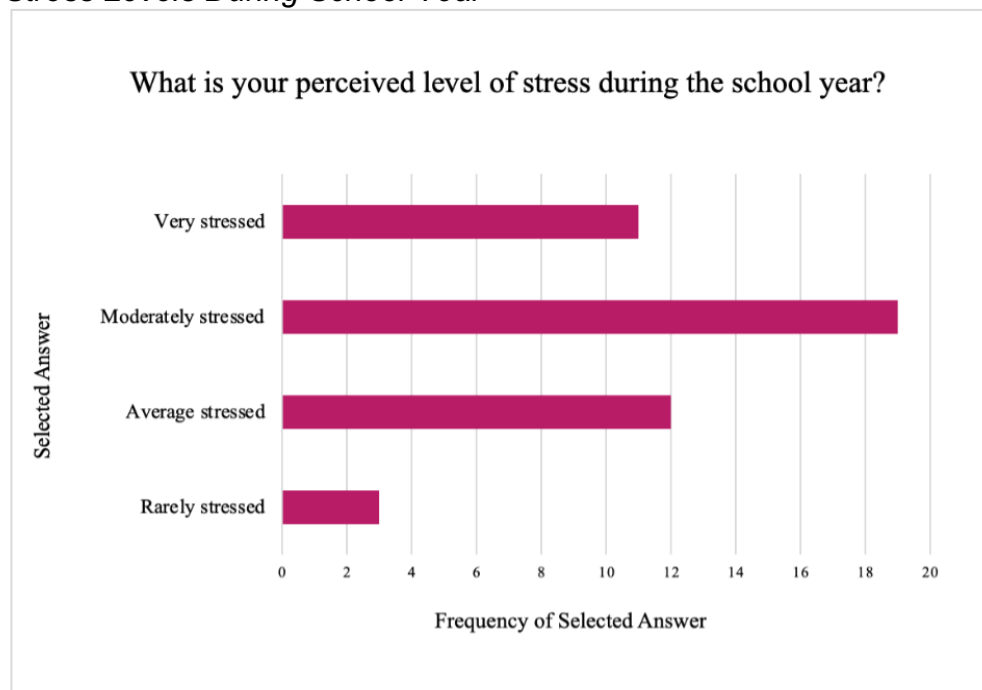
More general questions were asked on our participants' average amounts of exercise and sleep. Additionally, 26.7% of participants claimed to exercise daily, and 44.4%

claimed that they exercised once a week. We were pleased to see that university students had such high levels of exercise. In regard to sleep, 60% of our sample slept for an average of 7-9 hours per night and 37.8% slept for 4-6 hours. Only 1 individual selected 10+ hours of sleep per night. This is expected for university students.

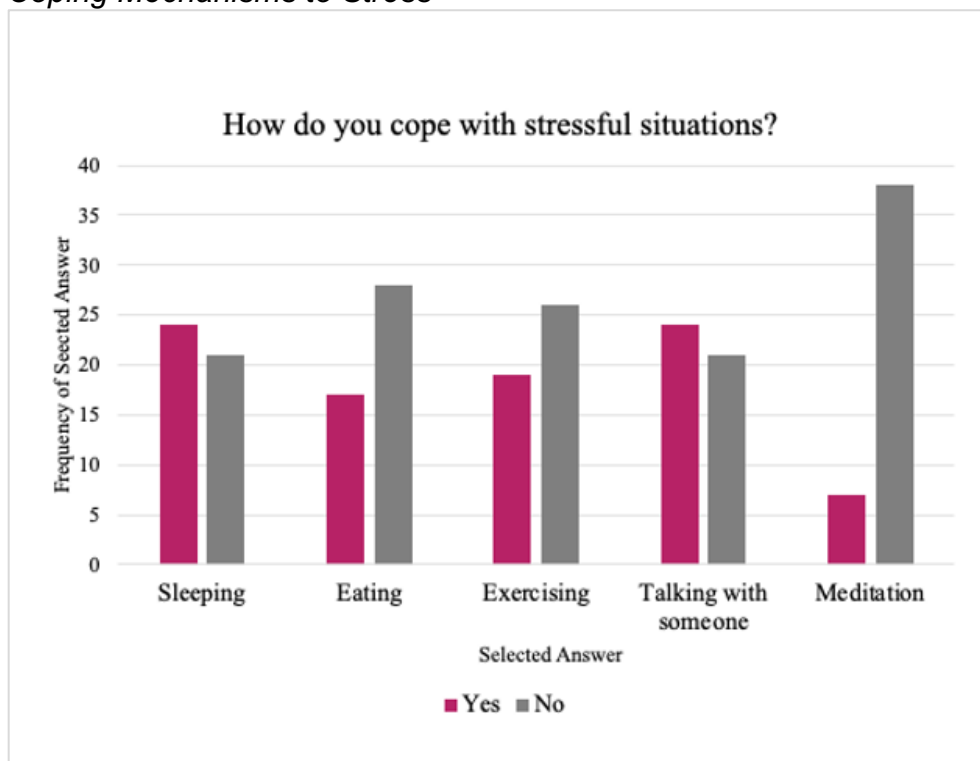
### ***Stress Levels and Coping Mechanisms***

We asked multiple questions on stress levels, including perceived level of stress during the school year, and whether or not these levels are increasing, decreasing, or staying the same. 53.3% of our sample chose 'increasing' stress levels, and 42.2% selected 'staying the same'. Only 4.4% selected 'decreasing' in regard to stress levels. Running a cross tabulation test with these results and amounts of exercise showed that those who participated in less exercise ('a few times a month'), were more likely to select increasing levels of stress. However, those who participated in more exercise ('once a week' or 'everyday') were almost just as likely to select 'staying the same' as they were 'increasing' in regard to stress levels. During the school year, 42.2% of our participants said their stress levels were moderate, this meaning more than average, which was selected 26.7% of the time. Additionally, 24.4% of our sample selected 'very stressed' and only 6.7% selected 'rarely stressed' in regard to their perceived stress levels during the school year. These results can be seen in Figure 10. Coping mechanisms to stress were also examined, and we found that 'talking with someone' and 'sleeping' were selected the most, however they also were almost not selected just as many times as they were selected, which can be seen in Figure 11. Also, it is important to note that exercising was not selected more times than it was selected, meaning that most university students did not see physical exercise as a useful coping mechanism.

**Figure 10**  
*Stress Levels During School Year*



**Figure 11**  
*Coping Mechanisms to Stress*



### ***Influence on Well-Being***

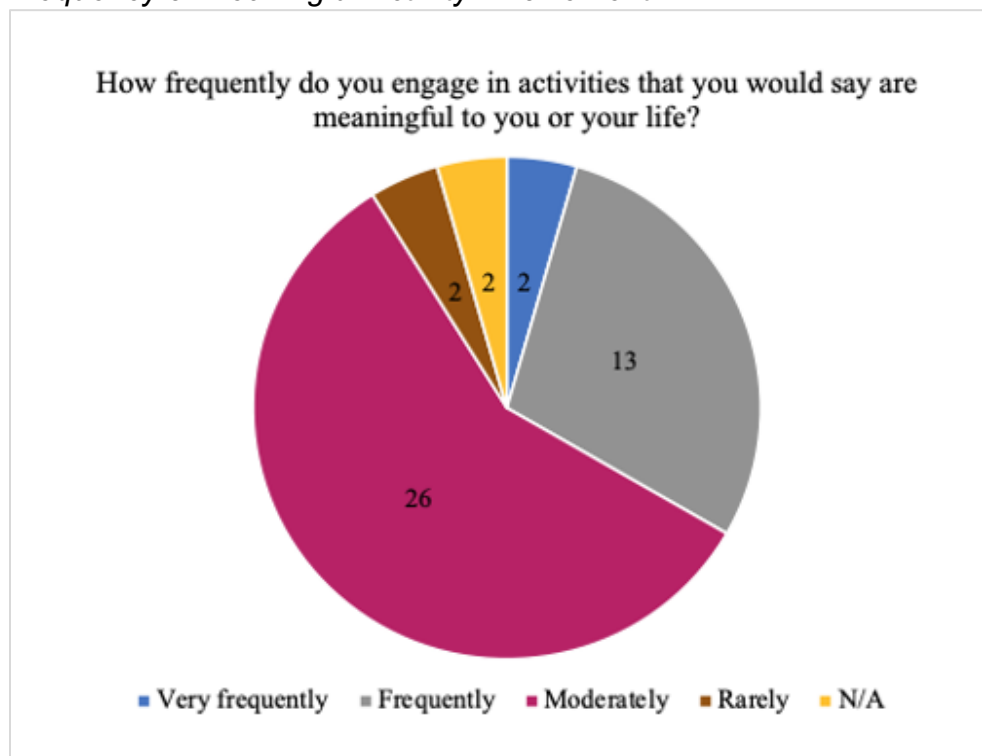
In order to analyze university students' overall sense of well-being, we asked them to choose from a list of options on what they considered to have the greatest impact. The list we provided consisted of the following terms, 'sense of identity', 'grades in school', 'sleep patterns', 'dietary patterns', 'family/friend relationships', 'romantic relationships', 'physical activity' and 'sport/club involvement'. 'Grades in school' seemed to have the biggest influence, as it was selected 88.9% of the time to have an impact on well-being. 'Family/friend relationships' was the next highest, being selected 77.8% of the time by our participants. Interestingly, 'physical activity' was selected to not have an impact 55.6% of the time. A cross tabulation test revealed that those who selected against physical activity having an influence on well-being, also were the same individuals who had previously selected 'few times throughout the year' (n=4) and 'not at all' (n=1) when asked about their amount of exercise. Due to the fact that the question about the amount of exercise was asked first, these individuals could have felt like they had to vote against physical exercise having an influence on their well-being because it would then mean that they themselves could have a more negative mental well-being because they are not exercising. Another interesting result of a cross tabulation test showed that those who selected against physical activity having an influence on well-being, also were most likely to have selected 'unsatisfied' when asked about their physical health. Of the individuals who selected 'yes' (n=20) when asked if physical had influence on well-being, none of them selected 'average' or 'satisfied' with their mental well-being, with 80% (n=16) of them selecting 'unsatisfied' and 20% (n=4) selecting 'very unsatisfied'.

### **Engagement with Meaningful Activities**

We asked our participants to reflect on how often they participate in activities that are meaningful to them, the results show that the large majority of participants selected 'moderately' (57.8%), which is less often than the second highest selected answer, which was 'frequently' (28.9%). 'Very frequently', 'rarely' and 'no answer' each had 4.4% of the remaining participants. The results of this question can be viewed in Figure 12.

**Figure 12**

*Frequency of Meaningful Activity Involvement*



### **Involvement of Extracurricular Activities**

Our sample showed almost a direct split when asked about their involvement with any extracurricular clubs/teams. 46.7% selected 'yes' and 48.9% selected 'no'. The remaining 4.4% were no-responses. Interestingly, in the previous question on what has influence on one's well-being, 'sports/club involvement' was selected against by 31 participants out of 45, and only 14 selected that they do believe it has an influence on well-being. In fact, 13 participants who selected against sports/club involvement on having an influence on well-being, selected 'yes' to being involved in extracurricular clubs/teams. This could possibly mean that they do not enjoy their time with these clubs/teams, or just that because they are a part of them, they have more knowledge about whether or not they have influence on their mental well-being.

### **Themes Discovered Through Word Association**

Our survey asked participants three-word association questions: what words do you associate with the term mental well-being, with the term physical health, and the term university? These answers were then coded based on the notion of the word being

perceived as positive or negative, and/or related to physical health, mental well-being or university.

### **Words Associated with Mental Well-Being**

When asked about what words the participants associate with the term mental well-being over half (57.8%) answered with phrases coded as physical health. This supports our hypothesis that there is a perceived connection between one's well-being and physical health. It is also important to note that 73.3% of participants tended to view mental well-being with a more positive outlook, as opposed to the 6.7% of participants who associated well-being with answers themed as negative. Furthermore, there were also an abundance of answers relating to mental well-being which can be supportive, as there is a clear understanding of what mental well-being is. There were also less significant responses that were recorded and can be viewed in Figure 13.

**Figure 13**

*Frequency Chart – Themes for Words Associated with Mental Well-Being*

<b>Themes</b>	<b>Frequency</b>
Positive <i>Ex. "Happiness", "Confidence", "Relaxed"</i>	33
Negative <i>Ex. "Depression", "Anxiety"</i>	3
Physical Health <i>Ex. "Energy", "Healthy living"</i>	26
Mental Well-Being <i>Ex. "Mental health", "State of mind", "How they are feeling"</i>	34
University <i>Ex. "Not university", "Good grades"</i>	2
Positive Physical Health <i>Ex. "Energy", "Healthy living"</i>	18

Negative Physical Health	0
Positive Mental Well-Being <i>Ex. "Happiness", "Motivated"</i>	26
Negative Mental Well-Being <i>Ex. "Depression", "Anxiety"</i>	1
Positive, University <i>Ex. "Good grades"</i>	1
Negative, University <i>Ex. "Not university"</i>	1
No Response	5

*Note.* Participants (n=45) may have provided multiple answers that could be represented multiple times.

### **Words Associated with Physical Health**

As displayed in Figure 14, it is clear that the participants tended to mainly view the term physical health with themes of physical health (86.7%). Of these 86.7%, 92.3% observed positive physical health terms, such as "drinking enough water". An interesting connection between Figure 13 and Figure 14 is the use of the word's "energy" and "healthy", both in which were themed as physical health, and were answers associated with both mental well-being and physical health. This commonality between the terms well-being and physical health allows us to draw a stronger connection of this relationship due to their being a conjunction of similar associations. With only 20% of the responses being coded as being related to mental well-being, we can make the assumption that students perceive well-being having a greater impact on physical health, as opposed to physical health impacting well-being.

### **Figure 14**

*Frequency Chart – Themes for Words Associated with Physical Health*

Themes	Frequency
--------	-----------

Positive <i>Ex. "Active", "Happy", "Energy"</i>	38
Negative <i>Ex. "Thin ideal", "Sluggish", "Injury"</i>	5
Physical Health <i>Ex. "Exercise", "Sleep", "Nutrition"</i>	39
Mental Well-Being <i>Ex. "Motivation", "Stress reliever", "Appearance"</i>	9
University <i>Ex. "Not university"</i>	1
Positive Physical Health <i>Ex. "Fit", "Drinking enough water", "Healthy"</i>	36
Negative Physical Health <i>Ex. "Obesity", "Weak", "Sluggish"</i>	3
Positive Mental Well-Being <i>Ex. "Happy", "Stress reliever", "Motivation"</i>	3
Negative Mental Well-Being <i>Ex. "Thin ideal"</i>	1
Positive, University	0
Negative, University <i>Ex. "Not university"</i>	1



No Response	5
-------------	---

*Note.* Participants (n=45) may have provided multiple answers that could be represented multiple times.

### **Words Associated with University**

Unlike the responses to words associated with the terms mental well-being and physical health, the words associated with university tended to have a negative connotation. As shown in Figure 15 answers themed negative was 53.3%, whereas Figure 13 was 6.7% and Figure 14 was 11.1%. These results help to emphasize the participants' perceptions of well-being and physical health being unsatisfied (73.3%) or very unsatisfied (20%) within university students. It brings in the negative impact university has towards well-being and physical health as we don't see the negative responses until the variable of university is included in a question. Furthermore, 55.6% of respondents' answers related to the theme of mental well-being when asked about university. Additionally, 52.5% of the total answers were associated with specifically themes of negative mental well-being. With the data displayed in Figure 15, along with Figure 13 and 14, we are able to perceive a causal chain in which university affects one's well-being, which ultimately affects one's physical health. In summation, university as a variable affects both well-being and physical health, aiding in our hypothesis.

### **Figure 15**

*Frequency Chart – Themes for Words Associated with University*

<b>Themes</b>	<b>Frequency</b>
Positive <i>Ex. "Achievement", "Community", "Motivated"</i>	16
Negative <i>Ex. "Stress", "Overwhelming", "Rushed"</i>	24
Physical Health <i>Ex. "Tired", "Unhealthy"</i>	4
Mental Well-Being <i>Ex. "Friends", "Meaningful experience", "Rewarding"</i>	25

University <i>Ex. "Difficult", "Grades", "Online"</i>	36
Positive Physical Health	0
Negative Physical Health <i>Ex. "Tired", "Unhealthy"</i>	4
Positive Mental Well-Being <i>Ex. "Meaningful experience", "Community", "Achievement"</i>	11
Negative Mental Well-Being <i>Ex. "Stress", "Depression", "Annoyance"</i>	21
Positive, University <i>Ex. "Adventurous", "Career", "Opportunity"</i>	7
Negative, University <i>Ex. "Expensive", "Scum", "Difficult"</i>	8
No Response	5

*Note.* Participants (n=45) may have provided multiple answers that could be represented multiple times.

## Discussion

### Relationship Physical Health and Mental Well-Being

The relationship between physical health and mental well-being is one of a complicated nature. Throughout the course of our research, we have concluded that there is however, a strong relationship between mental well-being and physical health. More specifically, there is an apparent link between declining well-being with poor physical health. In our study, 88.9% of participants reported having headaches when operating in a state of deteriorating mental well-being. Additionally, 73.3% noted experiences of frequent

muscle tension and unsatisfactory mental well-being. These findings are suggestive of a distinct relationship between both negative physical health and mental well-being as participants perceived declining states of well-being with physiological responses. This supports our hypothesis in that the state of one's well-being can influence their physical health through means of headaches, muscle tension, unhealthy eating patterns, and lack of sleep. Additionally, we found that as conspicuous the relationship between declining well-being and negative physical health, there was also a clear connection of positive well-being with practical physical health. Soo Kim et al. (2012), note the effects physical health can have on well-being and the ideal relationship they can share. Expanding on this, we developed an understanding that motivation to participate in a healthier lifestyle (i.e. exercising, eating healthier, etc.) is more likely to occur while in a state of positive well-being. This claim is supported by 97% of participants selecting activities related to good physical health in association with positive well-being as compared to the 1% of healthy patterns associated with declining well-being.

Furthermore, the findings displayed in Figure 8 and Figure 9 are indicative of a pattern, showing that the connection between mental well-being and physical health is reciprocal. This notion is supported by the research study conducted by Adams et al. (2007). Their findings not only help to support the reciprocal nature of the relationship between mental well-being and physical health, but also show that exercise, such as strength training, is directly correlated with positive mental well-being. This works to prove that in the same way that a negative mental state will cause a poor physical state, an individual with superior physical health will equivalently display superior state of mental well-being. Additionally, positive well-being and good physical health tend to occur symbiotically. The article from Adams et al. (2007) assists in providing evidence to help back up claim that mental well-being has implications on physical health and vice versa.

Apart from positive well-being playing a factor in motivation to exercise, we asked participants whether enhancing well-being and outlook or societal pressures had the greatest impact to work out. Although 57.8% of participants chose enhanced well-being and outlook as the main factor to work out, it is important to note 42.2% still chose they exercised mainly due to societal pressures, making the gap between the options small. This differed from how we had accepted the results to look, as we assumed a greater majority would have chosen the option to increase well-being. This particular survey question aligned with the research of Hayes & Ross (1986), in which their focus was on similar variables; whether physical health was impacted more by societal expectations or internal processes. Hayes & Ross (1986) research can allow us to note however, that participants that responded their motivation to exercise was heavily due to expectations from society, would not have discredited our findings as the impact this variable has on well-being is non-existing. Thus, our hypothesis that there are perceived effects of well-being on physical health could still be supported from our collected data.

Beyond just an obvious correlation between mental well-being and physical health, our data helps argue that university students are perceived to be, on average, unsatisfied with both their physical health and their mental well-being. Our findings report that when asked about their perception of overall physical health for university-aged students, 44.4% of participants reported 'unsatisfied'. Even more alarming, when asked about their perception of overall mental well-being for university-aged students, 93.3% of participants reported that they believed the average university-aged student was either 'unsatisfied'

or 'very unsatisfied' with their mental well-being. Not only do these figures raise a concern for the overall well-being of individuals in their late teens and early twenties, they also further prove the correlation between mental well-being and physical health as we see the majority selected responses for both physical health and well-being falling under 'unsatisfied'.

Authors Hayes and Ross (1986) extrapolated results also indicative of a strong relationship between the two variables. Hayes and Ross (1986) determined through their research that regular exercise and maintenance of notable physical health had a direct improvement on the psychological well-being of their participants. As mentioned above, many of our respondents initially reported feeling displeased with their physical health. This accounted for almost half (48.8%) of the participants remarking they felt 'unsatisfied' or 'very unsatisfied'. Additionally, over 93% of respondents selected feeling 'unsatisfied' or 'very unsatisfied' in relation to mental well-being. These variables are very clearly linked, proving that a dissatisfaction among physical health and mental well-being is indicative of a direct relationship between the two. Although our findings differ regarding positive/negative correlations, the study by Hayes and Ross (1986) strengthens our hypothesis that a reciprocal connection exists between an individual's mental well-being and physical health.

It is important to note that the results our data displayed tended to account for perceived relationships between negative mental well-being and poor physical health; however, our findings still supported our original hypothesis that one's state of well-being does in fact have implications on aspects of physical health. There is evidence, specifically in motivation to participate in a physically healthy lifestyle, also supporting the connection that positive well-being can have with good physical health, although not as abundant. When adding the variable of university to the question does well-being impact physical health there is possible evidence in why these two factors were seen as low.

### **Perceived Influence of University**

Alongside our main research question, we were also interested in the ways in which being a university student impacted the relationship between well-being and physical health. As displayed in Figure 5, it is made clear that education is typically ranked as the top priority in students' lives. However, of the 46.7% of participants choosing education as their top rank, 76.2% stated they perceived students' well-being as 'unsatisfied'. These results give insight that noting education as your top priority may contribute to the overall dissatisfaction with one's well-being. This insight allows us to wonder if those who positioned education as a priority in their lives have higher standards for their academic performance and thus, a greater deal of stress from school, contributing to a decline of well-being. Based on the literature currently available in this subject, we believe that it can prove effective to do research on the specific implications of academic stress on well-being to further insight in this topic area.

In contrast with much of the data gathered from our study, when university students were asked about their exercise and sleeping habits they appeared to be typical. As seen in Brain Basics (2006) adults require 7-9 hours of sleep every night, aligning with the majority of participants (60%) response of sleeping an average of 7-9 hours per night. Additionally, 71.1% of the university students that participated answered that they exercise once or more a week. With these results we gained insight that, although it

appears these students are living a healthy lifestyle, their perception of their peers differs. This contrast in results may be due to the fact that participants wished to portray a more ideal physical lifestyle, but when asked about how they perceive others answered more truthfully.

In Figure 10, perceived levels of stress during the school year displayed that 66.7% of participants experience moderate or high levels of stress contributing to negative states of well-being. The emphasis of stress in relation to university was strengthened through our question on words that one associates with the term university. Of the participants who responded to this question, over half associated university with the word 'stress'. It was interesting to see results of how these individuals cope with stressful situations, as we had predicted most would answer with exercise. However, less than half of the participants noted exercise as a coping mechanism, as opposed to 53.3% of participants choosing sleep or talking with someone as strategies to deal with stress. Sleeping, if outside of the recommended 7-9 hours is not noted as a healthy coping mechanism, and thus aids in perspective that well-being had a direct effect on physical health (Brain Basics, 2006). An unexpected factor, not previously included in our research was that of talking with others. This was noted as one of the top coping strategies in which participants chose. Discussions with others may assist in motivating them to work on their physical health and/or is likely have positive effects on mental well-being.

We were able to gain insight into how university factors into the effects of well-being and physical health. Although there was no strong evidence tying university alone to one's physical state, there was significant evidence supporting the impact university has to well-being. With the documentation of past literature and data we have gained in support of our hypothesis, we can however conclude that university, through affecting one's mental well-being, ultimately has effects on their physical health as well.

### **Word Associations**

Word associations can help guide researchers in the analysis to interpret data and gain a deeper understanding of what the participants are feeling and how they engage with certain terms. Our research survey utilized three word-association questions; what words do you associate with the term well-being, with the term physical health, and the term university. These questions allowed us to make inferences and confirm our hypothesis that there is indeed a perceived connection between one's well-being and physical health.

When prompted to list words that the participant associated with mental well-being, 57.8% responded with phrases pertaining to physical health. This shows a strong connection between both mental and physical health, suggesting that each variable can directly affect the other. Additionally, over 70% of respondents replied with positive word associations for the term mental well-being. This brings about some contradiction to other questions asked in our survey, such as 93% of respondents reporting that they believed the average university-aged student was either 'unsatisfied' or 'very unsatisfied' with their mental well-being. This highlights the difference between perceived mental well-being in others and how mental well-being on its own is generally thought of. One explanation for this difference could be the use of attribution theory. This may have led to an overestimation in the perception of others behaviours, leading to the contradiction we see above.

When prompted to produce words associated with the term physical health, 84.4% of respondents replied with a positive associated word or phrase. Only 11.1% responded with a negative association, highlighting words such as “thin ideal”, “sluggish”, or “injury”. This is suggestive of a contradiction to a previously asked question in our survey. As mentioned above, over 88% of participants reported having both headaches and poor mental well-being, and over 73% noted experiencing frequent muscle tension and unsatisfactory mental well-being. This may be explained through cognitive dissonance theory. There may be conflicting thoughts of what one wishes they felt towards mental well-being, physical health, and how they actually feel, causing mental discomfort which then leads to an alteration of one belief or the other (Festinger, 1962).

Furthermore, when prompted to list words that the participant associated with university, the majority of the answers appeared to have a negative undertone. With 52.5% of respondents associating negative terms with the word ‘university’, we saw use of language such as “overwhelming”, “stress”, and “rushed”. This is indicative of a problem within the confines of the university institution, suggesting a much larger problem than we originally anticipated. This might be indicative of a correlation between all three variables; university, mental well-being, and physical health. It is possible that university causes feelings of stress and overwhelm, leading to a declining state of mental well-being and /or physical health. It is clear that these variables are interconnected, however it is necessary to conduct more research on this topic to conclude a hypothesis.

It is imperative to note that the words “motivation” or “motivated” were listed as a response to each word association question, signifying that respondents believe motivation is tied to physical health, well-being, and university. This finding not only demonstrates that motivation is a key factor of university success, but is also vital for the upkeep of physical health. Motivation however, stems from mental well-being, further verifying that adequate physical health comes as a result of superior mental well-being.

Additionally, the notion of “meaningful experience” was a frequent response when asked to associate words with university. This was not a variable we had previously considered statistically important prior to collecting our data. Through this research, we have determined that a meaningful university experience is something that many undergraduate students are craving and deem important for academic success and mental and physical well-being.

### **Role of Belonging**

Through our research and analysis, it became evident that having a sense of belonging played a role in students' well-being, and through responses, it was noted that university provided some sense of community, aiding individuals' desires to belong. As noted by Gopalan & Brady (2020), having a sense of belonging is a fundamental human attribute, in which mental well-being can be improved by. Noting the existing reciprocal relationship between well-being and physical health, there is linked evidence that the role of belonging also positively affects physical health. When asking participants what influences their well-being ‘family/friend relationships’ was selected 77.8%, as opposed to the 55.6% of participants selecting that physical activity did not influence their well-being. This result may be attributed to the sense of belonging one feels when around friends and family. As there was a significant difference between the two factors, we deemed it necessary to further explore the relationship between belonging and well-being.

Specifically, there was an individual who used the phrase “meaningful experience” when asked for words associated with university. Meaningful experiences are situations in which you are participating in shared experiences, attributing to one’s sense of belonging. To grow on the importance of meaningful experiences, we asked participants how often they engage in activities meaningful to them. Over half (57.8%) of the participants responded that they engaged moderately, and the next highest majority was those who engaged frequently (28.9%). Future research could expand on this idea, specifically looking at what type of activities are involved and how it directly contributes to well-being.

Universities can be noted as grounds to find community and belonging within the school itself, as was referenced in words associated with the term university. Furthermore, university provides extracurricular activities for individuals to get involved with such as sports and clubs. We were interested in noting the relationship membership has with well-being. However, our predictions of there being a strong relationship was not supported by the results. Of the 46.7% of participants who selected they were involved in extracurricular activities, 13 of them had selected that sports/club involvement has no influence on well-being. This may be attributed to a lack of shared perspectives between the individual and group, as it differs from past research in which having these groups provide a sense of belonging, ultimately promoting mental well-being (Gopalan & Brady, 2020).

Having individuals around oneself when looking at a different perspective, does have positive effects on well-being as seen in coping mechanisms. From our research there is evidence that one of the main ways students’ deal with stress is through talking with others. By having this connection and relationship, they are provided a community in which they feel they belong to. So although there is a perception that extracurriculars play little to no role in well-being, having a community in which there is a level of comfort to open up and discuss with results in evidence that belonging does play a role in the well-being of students.

Although when looking at the factor of belongingness it is typically in reference to well-being, it is not to say that there is no connection between belonging and physical health. In a study done by Bailey & McLaren (2005), there is evidence that participating in physical activity was more likely to be done when participating in it with others. It would be interesting to take this information and apply it within a university context to gain deeper insight that the role belonging has, not only mental well-being, but also individuals’ physiology.

### **Relation to Theories**

Through further analysis between our results and social psychological theories, it has been made evident that our results regarding activities associated with other’s behaviours in states of positive and declining well-being reveal an association to attribution theory. Specifically, in explaining the causes of participants behaviours in different states of well-being. For example, motivation to exercise, motivation to get work done, eating healthier, and sound sleep were the most common behaviours associated with positive well-being. This allows our research to attribute positive states/feelings of well-being to promoting engagement in positively reflected behaviours. Thus, individuals who experience positive behaviours are more likely to work harder to maintain their positive state/feelings,

increasing their level of physical health and mental well-being. Differentially, headaches, muscle tension, eating little to none, eating excessively, and sleeping less were behaviours revealed among participants who experienced declining states of well-being. As a result, the results also reveal that there is an attribution between declining states/feelings of well-being causing negatively reflected behaviours. With that being said, if individuals are expressing declining states/feelings of well-being, they tend to experience negative side effects in terms of their physical health.

Continually, it seems that participants within this study experience more dispositional attributions, rather than situational attributions. Meaning that regardless of whether their states were positive or negative, their internal feelings affected their overall satisfaction with their physical health and mental well-being, resulting in a consensus of unsatisfied answers among participants (Heider, 1958). Therefore, if most participants are unsatisfied with their physical health and mental well-being, we can attribute these levels of dissatisfaction to perceived internal feelings. However, from a situational perspective of attribution, some participants may be more influenced by their social environment, in that the results displayed moderate levels of stress during the school year among university aged students. This means that school is representative of their social environment and the moderate feelings of stress are a result of the external factor of school demands placed on students. More specifically, in order to make sense of this finding within attribution theory, when the level of school demands increases or decreases, students' level of stress increases or decreases as a result.

In addition, the theory of cognitive dissonance played a key role in determining the perceived relationship between students' physical health and mental well-being. This relationship was most clearly displayed in the results regarding coping mechanisms being used as a way of restoring the balance between participants' cognitions. With that being said, the results revealed sleeping and talking to someone as the most common ways for coping with stressful situations. This means that when participants are feeling stressed, the stress acts as the cognition and the need to utilize coping mechanisms is the way in which participants attempt to balance the dissonance of their emotions and behaviours. Thus, when participants have declining states of mental well-being, but use sleep as a way of coping with their feelings, they are displaying behaviours of cognitive dissonance in that the behaviour of sleeping does not align with the expected desirability to improve one's mental well-being. Similarly, individuals who used the method of talking to someone in order to cope with stress also revealed a relation to cognitive dissonance by being motivated to seek help, these individuals are restoring balance within their cognitions to avoid the feeling of discomfort or stress (Festinger, 1962).

As well, the results regarding participants' perception of how frequently they believe they engage in activities that are meaningful to their lives, reveal that the majority answer of "moderately" is greatly correlated with the theory of cognitive dissonance. This is because it represents a behavioural process within cognitive dissonance known as counter-attitudinal behaviour. Within this process, respondents disclosed moderate participation in meaningful activities, however the large majority of participants are also dissatisfied with their physical and mental well-being. Thus, these two factors convey an inconsistency among participants' behaviours/activities and the believed perception of their physical health and mental well-being. With that being said, students' feelings of being stressed or dissatisfied with physical and mental well-being has proven to associate



negative terms when referring to university. This means that students will be motivated to attempt to eliminate the feeling of discomfort and achieve a more balanced cognitive outlook regarding their university experience.

### **Coping Methods**

Coping methods of university students are a heavily researched and debated topic. Our findings suggest that although regular exercise and maintenance of physical health will only benefit the individual, many university-aged students engage in various other coping mechanisms. In opposition to our hypothesis, exercise was rarely selected as a significant coping mechanism for stressful situations, with 57.7% selecting against it. This allows us to question the true nature of the problem at hand. If physical activity was a more commonly used coping mechanism, it is possible that we would see the declining rates of mental well-being turn around.

Many participants chose “talking to someone” or “sleeping” as coping mechanisms 53.3% of the time. Perhaps ‘sleeping the stress away’ only avoids the stress and leads to more overwhelming feelings of worry and trouble in the future. Researchers Herbert, Meixner, Wiebking and Gilg (2020), conducted a research study aimed at university students, to determine the impact that regular physical activity had on perceived levels of stress. Herbert et al. (2020) found that incorporating low to moderate physical activity into the daily schedules of university students will not only improve their psychological well-being but show significant reductions in perceived stress in all areas. This research speaks volumes to the importance of incorporating daily physical activity into the lives of university-aged students, as they will then experience reduced levels of overall stress and improved psychological states.

Moreover, authors Graaf, Ten Have and Monshouwer (2011) found significant research concluding that physical exercise is directly correlated with a lower likelihood of mental disorders and better mental health. Our research clearly emphasizes this connection, but through insights gained during our research, we are able to acknowledge that a lack of motivation may cause a severe struggle to maintain a healthy, active lifestyle. The lack of motivation coupled with the absence of physical activity may prove to have a negative impact on mental well-being. Exceptional motivation is often a result of quality mental well-being, and thus reinforces the conviction that superior mental well-being promotes superior physical health.

Further research on the use of exercise as a coping mechanism for stress is needed, but our findings, coupled with previous literature, show significant evidence in favour of utilizing exercise as a healthy coping method for stress.

### **Broader Significance**

Although our sample only included undergraduate students from McMaster University, we believe our findings to be generalizable to the broader society of university students. Not only does our research provide significant insights for the McMaster community, but would provide many deeper understandings for other university communities. Understanding the reciprocal nature of our variables is vital to interpreting and utilizing the data. We found that the strong correlation between mental well-being and physical health was a clear indicator of larger societal problems, specifically the lack of healthy coping mechanisms used by university students. We were unable to determine the impact

that self-identified gender had on our variables due to lack of male respondents, we believe that this may have skewed our findings, due to the hegemonic masculinity that is still present in our society today.

In relation to our findings, we suggest further research on gender specific experiences at university, more importantly the connection between perceived mental well-being and physical health. With that being said, although our results are based on perceptions of McMaster students, future implications of our research can aid other universities by making them aware of the perceived level of stress that university students experience. This would allow universities to identify ways to adapt their campus provided services to improve the mental well-being of students across a greater population. This could involve the incorporation of physical health programs that are proven to increase mental well-being overall. As well, future research could look at the long-term effects of stress experienced among students during their university careers and the way in which this stress contributes to the maintenance of physical health and mental well-being habits in later adulthood.

## **Conclusion**

### **Summary**

The main focus of our study was to provide further insight on the composite relationship between the mental well-being and physical health of undergraduate university students. Our research aimed to examine the complex relationship between mental well-being and physical health and to further determine the significance of these correlations. We were able to conceptualize this correlation by focusing on the main themes of physical health, mental well-being and university. When coding the results of our study, we added additional codes that would allow us to better analyze whether or not participants perceived their overall mental well-being and physical health in a positive manner or more negatively. By using cognitive dissonance theory, we were able to better understand the correlation between mental well-being and physical health and how a negative correlation between the two may create dissonance in individuals.

Additionally, we utilized attribution theory in order to understand how participants may attribute certain states of mental well-being to behaviours associated with either positive or negative physical health. In order to ground our study and conceptualize our ideas, we analyzed existing literature that focused on this connection. Much of this research however, focused on how physical health impacts mental well-being, in comparison to our study which focused on the opposite, how mental well-being impacts physical health. For future research, we touched on limitations that may be considered when conducting future research on this topic. The data collected for this study was obtained by posting on McMaster University related Facebook pages. By using the online survey platform, LimeSurvey, participants anonymously completed our survey and provided us with a total of 45 responses. Our data concluded that poor mental well-being is a large contributor to poor overall physical health.

### **Limitations**

While conducting our research, we found multiple limitations in our methods, literature, and theory that we used. The first limitation in our approach was the method of data collection used. As we conducted this research throughout the ongoing COVID-19

pandemic, we were unable to use in person and on campus data collection methods. As a result of the circumstances and safety protocols of the pandemic, we relied on posting on McMaster University related Facebook groups to recruit our participants as our main method of data collection. This method was flawed as it was very difficult to gain permission to post on these pages, as well as to recruit a large number of participants from these pages to complete our survey. Further, these online forums made it difficult to encourage participants to fully complete our survey. Some participants did not fully complete our survey, forcing us to exclude their partial data that was collected. Originally, our group aimed for a sample size of roughly 75 participants, however, we only received 45 participants in total.

As a result of our small sample size of participants, we faced other limitations during the data analysis process of this study. Specifically, there was a lack of gender diversity in the participant responses, as roughly 60% of our participants self-identified as female. As our group sought to gain insight in gender differences within our research topic, the lack of gender diversity caused us to exclude questions involving gender completely. Since the majority of participants self-identified as female, the lack of diversity in gender responses would not have provided data that is generalizable to show differences between gender. When analyzing the participants of this study, it is notable that about 86% of our participants were either 20 or 21 years old. This may create a limitation within our study, making it more likely that many of our participants were in their third or fourth year of their undergraduate program as the results of our study are not generalizable across all levels at McMaster University. Given this information, future researchers on this topic should aim to reduce the gaps between the level of study of each participant in order to produce more generalizable data to all undergraduate students. By doing this, researchers may be able to compare differences between each year of study as well. As a result of the ongoing pandemic, it is also important to note that our data may vary as a result of current societal conditions. It would be interesting to conduct similar research in the future in order to compare the results of both studies to view the impact that the COVID-19 pandemic may have placed on participants and their perceived mental well-being and physical health during this period of time.

As our research relied on participants to answer questions through LimeSurvey, in an anonymous and online manner, our research may be limited in that there is no way to ensure that participants responded authentically and accurately. As mental well-being may be a challenging topic to discuss, it is possible that some respondents did not answer questions accurately to their actual perceived level of mental well-being. This can also be applied to the topic of physical health, as many individuals feel pressured to maintain a high, desirable level of physical health due to societal pressures and may answer inaccurately as a response. Essentially, this can be accredited to a possible desirability bias in participants, where participants select answers that they perceive as socially desirable or favourable to others. In this scenario, this bias may have caused participants to select responses that they perceive as correct or applicable to our research study. Although there is no guarantee of this bias, it is very possible that it may have influenced our results.

## **Significant Insights**

The conclusions and results of this study are evidently significant in providing insight into the lived experiences of McMaster University students. Our research indicated that the state of one's mental well-being has serious implications on physical health, indicating that there is likely a correlation between these two variables. This finding is especially applicable, as it demonstrates how declining mental well-being may directly impact the overall physical health of undergraduate students. Further, it provided insight on contributors of declining mental well-being. Some of the major contributors to declining mental well-being in undergraduate students were directly associated with university itself. When asked to provide words associated with university, 62.5% of respondents provided terms associated with negative mental well-being, such as stress, overwhelming and depression. This finding is indicative in suggesting that university as a whole negatively contributes to the mental well-being of undergraduate students. This information can explain how stress negatively contributes to both mental well-being and physical health.

Further, there is importance in noting that participants' increasing dissatisfaction with both physical health and mental well-being may be due to the lack of sufficient coping mechanisms when dealing with stressors. With this information, future undergraduate students may be able to better prepare mindful coping mechanisms to deal with their stress. Often, exercise and healthy eating habits have been found to have positive impacts on both overall well-being and health when dealing with stress. However, these healthy coping mechanisms were not a popular response within our study where about 57.7% of participants voted against using these coping mechanisms. Rather than using these coping strategies, most participants responded that they either "talk to someone" about their stress or "sleep". This is a representative finding, as it reflects that more than half (53.3% of participants) selected responses associated with poor coping mechanisms to deal with stress. With this information, it may be suggested that universities provide students with more de-stressors, workshops and resources that provide information on how to deal with stress in more healthy ways. By providing these resources, it is possible that both the mental well-being and physical health of undergraduate students may be improved.

Within existing literature, findings have demonstrated that there is a clear relationship between physical health and mental well-being. Much of this literature focuses on how improving one's physical health often improves their state of mental well-being. Despite this correlation, there was a large gap in research surrounding how mental well-being impacts physical health, the reverse of the previous research topics. Our research provides information on some reasons why undergraduate university students are frequently unable to reach the recommended level of physical activity for their age range. Participants in our study most often attributed this to high levels of university related stress, with about 42.2% of participants stating that they had moderate levels of stress throughout the school year. Our research also found that about 93.3% of participants were unsatisfied or very unsatisfied with their mental well-being. These findings demonstrate the significant impact that stress may play in one's level of mental well-being. This stressed the idea that McMaster University and other academic institutions should provide better resources that may be helpful for students to improve their stress level, as it is evident that stress decreases mental well-being.

According to our qualitative, open ended questions, participants viewed physical health or well-being in a more positive light. When asked to list words associated with the term “well-being” in relation to physical health, the most common and frequent responses received were “healthy living” and “energy”. The positive word associations in this context demonstrate that students believe physical health can have a positive impact on overall mental well-being. From the perspective of a student, these results may encourage them to participate in more physical activities that could improve their overall level of physical health. In contrast, from the perspective of the university, this information should be taken seriously and attempts to further improve the well-being of students by implementing more activities involving physical activities should become more prominent.

### **Concluding Thoughts**

In conclusion, our research provided insight on the correlation between mental well-being and physical health in undergraduate students at McMaster University. We wish that our findings can provide students information on what may be contributing to their poor mental well-being. Further, we hope that the university will use this information to provide students with better, more accessible resources to improve their mental well-being. We believe that by doing this, students will be more satisfied with both their mental well-being and their overall physical health. Our team hopes that future researchers on this correlation will be able to reach a larger, more diverse demographic of students with a larger variety in age and gender. By conducting future research, more generalizable data may be received and can be more easily applied to these topics. We believe that it would also be interesting and significant to reconduct similar research on this topic after the COVID-19 pandemic passes. This may provide insight on the impact that the pandemic placed on students overall mental well-being, and in turn, their physical health.

### **Acknowledgments**

We would like to give a big thanks to Dr. Sarah Clancy for all her support and guidance throughout our research. Also, we would like to thank all the students who participated in the survey.

### **References**

- Adams, T., Moore, M., & Dye, J. (2007). The relationship between physical activity and mental health in a national sample of college females. *Women & Health, 45*(1), 69-85. doi: 10.1300/J013v45n01\_05
- Bailey, M., & McLaren, S. (2005). Physical activity alone and with others as predictors of sense of belonging and mental health in retirees. *Ageing and Mental Health, 9*(1), 82-90. doi: 10.1080/13607860512331334031
- Basics, Brain. (2006). Understanding sleep. *National Institute of Neurological Disorders and Stroke, Bethesda*. Retrieved April 2, 2021, from [https://www.education.ninds.nih.gov/brochures/17-NS-3440-C\\_508C.pdf](https://www.education.ninds.nih.gov/brochures/17-NS-3440-C_508C.pdf)
- Chakravarty, T. (2011). Medicalization of mental disorder: Shifting epistemologies and beyond. *Sociological Bulletin, 60*(2), 266-286. Retrieved October 10, 2020, from <https://www.jstor.org/stable/23620920>
- Clancy, S. (2020, October 1st). “Methodological Approaches in Social Psychological Research” [lecture]. SOCPSY4ZZ6, McMaster University.

- Festinger, L. (1962). Cognitive dissonance. *Scientific American*, 207(4), 93-106. Retrieved October 10, 2020, from <http://www.jstor.org/stable/24936719>
- Ghazal Read, J., Porter, J. R., & Gorman, B. K. (2016). Gender and the mental-physical health connection among U.S. adults. *Sociological Forum*, 31(4), 1104-1125. doi: 10.1111/socf.12298
- Gopalan, M., & Brady, S. T. (2020). College students' sense of belonging: A national perspective. *Educational Researcher*, 49(2), 134-137. doi: 10.3102/0013189X19897622
- Hayes, D., & Ross, C. E. (1986). Body and mind: The effect of exercise, overweight, and physical health on psychological well-being. *Journal of Health and Social Behavior*, 27(4), 387-400. doi:10.2307/2136952
- Heider, F. (1958). *The psychology of interpersonal relations*. New York: Wiley.
- Herbert, C., Meixner, F., Wiebking, C., & Gilg, V. (2020). Regular physical activity, short-term exercise, mental health, and well-being among university students: The results of an online and a laboratory study. *Frontiers in Psychology*, 11, 1-23. doi:10.3389/fpsyg.2020.00509
- Kelley, H. H. (1967). Attribution theory in social psychology. *Nebraska Symposium on Motivation*, 15, 192-238.
- Ohrnberger, J., Fichera, E., & Sutton, M.. (2017). The relationship between physical and mental health: A mediation analysis.. *Social Science & Medicine*, 195, 42-49. doi:10.1016/j.socscimed.2017.11.008
- Robson, C. (2014). *How to do a research project: A guide for undergraduate students* (2nd ed.). John Wiley & Sons Ltd.
- Soo Kim, Y., Soo Park, Y., Allegrante, J., Marks, R., Ok, H., Ok Cho, K., & Garber, C. (2012). Relationship between physical activity and general mental health. *Preventative Medicine*, 55, 458-463. doi: 10.1016/j.ypmed.2012.08.021
- Ten Have, M., De Graaf, R., & Monshouwer, K. (2011). Physical exercise in adults and mental health status: Finding from the Netherlands Mental Health Survey and Incidence Study (NEMESIS). *Journal of Psychosomatic Research*, 71, 342-348. doi: 10.1016/j.jpsychores.2011.04.001.