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Aerobic and Anaerobic Exercises in Relation to Anxiety and Depression

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by

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Abstract

The use of exercise is crucial as a treatment for various psychological disorders. However, as more research is being done, there seems to be a lack of consensus as to which type of exercise is most effective, aerobic or anaerobic. 232 students participated in this study via Qualtrics and were asked to fill out nine questionnaires: the Demographics Questionnaire, GAD7, Beck Depression Inventory, PCL5, QOLS, Exercise History and Attitudes Questionnaire, Satisfaction with Life Scale, the Healthy Eating Assessment, and the RYFF Psychological Well-being Scales. The results found that a combination of aerobic, anaerobic, and healthy eating improved overall well-being and life satisfaction. These results indicate that while one's overall quality of life is improved through exercise, it is still not clear whether aerobic or anaerobic exercise is most beneficial.

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Introduction

Exercise in all of its forms has been found to be beneficial in the treatment of physical disorders, but recently, there has been a growing interest in the role of exercise in treating mental illness as well (Canadian Chiropractic Association, 2019). Exercise can be divided into two categories: aerobic and anaerobic. Aerobic exercise makes use of oxygen in low-intensity, long-duration workouts, while anaerobic exercises don't make use of oxygen and primarily focus on high-intensity, short-duration workouts. In this study, I will examine these two different kinds of exercises in relation to psychological well-being and healthy eating in a sample of emerging adults.

The Physiological Effects of Aerobic and Anaerobic Exercises

Before discussing the psychological benefits of aerobic and anaerobic exercises, it is important to establish a connection between these exercises and physiological health as exercise is often linked with improved mental health. Aerobic exercise has been shown to be important for cardiovascular and respiratory health, and it has also been found to improve flexibility, endurance, weight control, and reduce the risk of heart disease (Canadian Chiropractic Association, 2019). Anaerobic exercises help build lean muscle mass, increase bone density, and strengthen the body for aerobic exercises (Canadian Chiropractic Association, 2019). There are also benefits in shedding fat and adding on healthy weight (Taylor, 2020). It is important to do both types of exercise as this is optimal for bone, muscle, and nervous system health as well (Canadian Chiropractic Association, 2019). According to the Canadian Society for Exercise Physiology, people between the ages of 18-64 should get at least 150 minutes of moderate to vigorous aerobic exercise per week, in addition to muscle and bone-strengthening activities at

least twice a week (Canadian Chiropractic Association, 2019). However, two-thirds of adults don't get the suggested 30 minutes of daily physical activity (Taylor, 2020).

The Psychological Benefits of Aerobic and Anaerobic Exercises

Aerobic and anaerobic exercises have both been demonstrated to positively influence patients with anxiety and depression. Both exercises have been shown to increase mood, well-being, and emotional recovery, while also reducing stress symptoms (Taylor, 2020) ("Exercise for mood, anxiety, and wellbeing," 2018). This overall increase in mood may be due to the socialization that occurs during specific exercises or even by just being outside (Taylor, 2020). A link between exercise and self-efficacy has also been found, which further demonstrates the benefits of exercise on mental health (Taylor, 2020). It has been shown that even after five minutes of exercise, mood-enhancement effects become activated (Taylor, 2020). Exercise has been shown to help manage feelings of fight or flight as both exercise and fight or flight create the same sensations: excess perspiration, increased heart rate, shallow breathing, etc. (Taylor, 2020). Under routine supervision, exercises have been found to be a good deterrent for panic attacks in those with panic disorders (Weir, 2011). Similarly to how the body reacts during a panic attack, one experiences similar physical sensations when exercising (Weir, 2011). Therefore, regular routine workouts will make it so people are less likely to panic when facing these fight-or-flight scenarios. Exercises have also been linked to improved mood and lessened anxiety by boosting serotonin levels and by normalizing sleep (Taylor, 2020). When discussing the effectiveness of both aerobic and anaerobic exercise, there is plenty of evidence in favor of their usefulness in combating anxiety and depressive disorders. However, the problem with prescribing exercise is that doctors don't yet know which exercises are most effective, how much

to exercise, and what exercises work in conjunction with other therapies, as these nuances vary from person to person (Weir, 2011).

Key Differences between Aerobic and Anaerobic Exercises

Aerobic exercises have been found to reduce anxiety for several hours, whereas many high-intensity, anaerobic exercises tend to have a lag time of about 20 minutes before a reduction in anxiety is felt ("Exercise for mood, anxiety, and wellbeing, 2018"). A study conducted at UC Santa Cruz also found that resistance exercises are not effective in reducing anxiety in the short term, but low- to moderate-intensity workouts have been found to decrease overall anxiety ("Exercise for mood, anxiety, and wellbeing, 2018). Low-intensity exercises were also found to have antidepressant effects on patients ("Aerobic exercise is an effective treatment", 2022). An additional study conducted by Jarbin et al. (2021) found that functioning improved after patients were made to follow a 14-week aerobic workout regimen. Within the year, overall well-being increased as well (Jarbin et al., 2021). Research has found that low-to-moderate resistance exercises with long rest periods rather than high-intensity exercises and strength training produce the most reliable results when reducing anxiety (Strickland & Smith, 2014). It has also been found that resistance training and other anaerobic exercises increase cognition and self-esteem and decrease depression (Strickland & Smith, 2014). Kianian et al. (2018) also confirmed this in their 2018 study. Depression, stress, and anxiety levels decreased, while overall happiness levels increased through anaerobic and aerobic intervention (Kianian et al., 2018). Interestingly enough, however, the study also found that anaerobic exercises were more effective in treating those with stress and anxiety, not aerobic exercises (Kianian et al., 2018).

Extraneous variables influencing exercise effectiveness

There are three factors that appear to influence the effectiveness of exercise on mental illness: personal preference, gender, and healthy eating habits. The effectiveness of these exercises appears to rely heavily on the preference of those with the illness. As stated by Weir (2011, para 18), "The problem with prescribing exercise is that it is still unknown as to which exercise is most effective, how much exercise to prescribe, and which exercise fits best in conjunction with other therapies." In regard to gender differences when comparing physical exercise, more males tend to actively participate in resistance training, but women are more sensitive to the effects of exercise than males (Strickland & Smith, 2014). When put under the same resistance exercises as men at a fixed or chosen intensity, women have been shown to have an overall stronger decrease in state anxiety (Strickland & Smith, 2014). Overall, it was found that both aerobic and anaerobic exercises are excellent tools to reduce overall anxiety and depressive symptoms.

When used in conjunction with exercise, healthy eating has also been found to have beneficial effects on mental health. Increased levels of exercise and healthier eating can lead to reduced levels of stress, anxiety, and depression, and has been found to lead to an overall improved quality of life (Eating Well, n.d.). Eating healthier foods in conjunction with aerobic and anaerobic exercises has been found to improve various physiological and psychological factors (Brown, 2018). As stated by Brown (2018), healthy eating has been found to boost energy and mood levels, improve quality of sleep, and reduce the risk of disease, osteoarthritis, anxiety, and depressive symptoms associated with obesity.

The Current Study

In this study, the focus population was primarily undergraduate college students. Research conducted by Colarossi (2022), mental illness has been on a severe decline since 2013, with there being a 135% increase in depression and a 110% increase in anxiety. As stated by Kara Lipson, an assistant professor of health law at Boston University, "College is a key developmental time; the age of onset for lifetime mental health problems also directly coincides with traditional college years—75 percent of lifetime mental health problems will onset by age 24" (Colarossi, 2022).

Given the research summarized above and the shortcomings of similar research, my research will focus on examining the relationship between different types of exercise (aerobic vs. anaerobic) and levels of anxiety, depression, PTSD, and overall well-being. Data was collected from various college students via SONA. Data will be gathered through various questionnaires including the Demographics Questionnaire, Generalized Anxiety Disorder Scale (GAD-7), the Beck Depression Inventory (BDI), the Posttraumatic Stress Disorder Checklist (PCL-5), the Quality of Life Scale (QOLS), the Exercise History and Attitude Questionnaire, the Satisfaction With Life Scale, the Healthy Eating Assessment, and the Ryff Psychological Well-being Scale. Given the connection between aerobic exercises and neurotransmitters, it is hypothesized that patients who engage in more aerobic exercises will show reduced anxiety symptoms, depressive symptoms, and higher overall well-being, compared to patients who engage in more anaerobic exercise. We predicted that participants who engage in both aerobic and anaerobic exercises will have the most benefits in their psychological health and well-being, including lower BDI scores, lower GAD scores, lower PCR scores, and higher Ryff psychological well-being scores. We predicted that those who have healthier eating habits will have higher quality of life and better

overall psychological well-being. We predicted that healthy eating would positively correlate with higher QOLS and satisfaction with life scores and lower GAD7 and PCL5 scores. We predicted that the more exercises a participant engages in, the higher the quality of life and better overall psychological well-being the participant will have. We predicted that the number of exercises a participant does will lead to greater scores on the GAD7, QOLS, PCL5, Beck Depression Inventory, and the Satisfaction with Life Scale. We predicted that the time spent at the gym will lead to greater scores on the GAD7, QOLS, PCL5, Beck Depression Inventory, and the Satisfaction with Life Scale.

Methods

Participants

This study was approved by the UCF IRB. There were 232 UCF students that participated in this study via Qualtrics. Participants anonymously completed a set of questionnaires asking about their exercise habits, eating habits, and overall health and well-being. Students who completed the study were awarded .5 SONA research credits to their assigned class. There were 204 participants between the ages of 18 to 22 years, 12 participants were between the ages of 23 to 27 years, and 4 participants were older than 27 years but younger than 32 years of age. There were 83 male participants, 135 female participants, and 1 participant identified as another gender. There were 114 participants who were Caucasian/white, 57 participants were Hispanic/Latino, 23 participants were Black/African American, 19 participants were Asian, 3 participants were West Indian/Caribbean, and 3 participants were of another ethnicity. There were 145 participants who were not employed, 63 participants were part-time employees, and 11 participants were full-time employees. 214 participants were single, 4 participants were married, and 1 participant was divorced. Finally, there were 133 participants who were Freshman, 39 participants were Sophomores, 29 participants were Juniors, and 18 participants were Seniors.

Procedure

Participants were recruited through SONA ,which is a data collection platform used by the psychology department. Once participants agreed to take part in the study, they were given a direct link to complete the study in Qualtrics. Participants first saw the informed consent form prior to beginning the questionnaires and were asked whether they wanted to participate in the study. Participants who agreed to participate in the study filled out the following questionnaires.

Demographics Questionnaire. The Demographics Questionnaire collected data regarding participants' descriptive variables. This questionnaire asked 12 questions in regard to age, gender, marital status, and even gym habits. It contained 11 multiple choice questions and one "select all that apply" question. In addition to demographic variables, the questionnaire also asked for basic exercise behaviors. For example, "Do you go to the gym alone, or with a friend?"

Participants were placed into categories depending on their answers to the question, "For what reason(s) do you go to the gym?". Depending on the participants' responses, they were placed into one of seven categories: biological, social, psychological, biological, and social, biological and psychological, social and psychological, and all.

Generalized Anxiety Disorder-7 (Spitzer et al., 1999). The GAD is a measure of anxiety. Participants first answered 7 questions on a slider in regard to general feelings associated with anxiety and rate those feelings on a scale of 0, meaning not at all and 3, meaning nearly everyday. For example, "Are you feeling nervous, anxious or on edge?"

Beck Depression Inventory (Beck et al., 1996). The BDI measured depression in both teens and adults. Participants completed a set of 20 slider questions, all scaled from 0 to 3, measuring feelings of depression. 0 refers to little or no feeling and 3 refers to near-constant or daily feelings of depressive symptoms. For example, “On a scale of 0-3 how would you rate your feelings?”

0 = I do not feel sad

1 = I feel sad

2 = I am sad all the time and I can't snap out of it

3 = I am so sad and unhappy that I can't stand it

Psychometric Properties of PTSD Checklist (Weathers et al., 2018). The PCL-5 measured symptoms of PTSD. Participants completed a set of 20 multiple choice questions asking them about their experiences with Posttraumatic stress. There are 5 answers for each question ranging from not at all to extreme. For example, “Do you experience repeated, disturbing, and unwanted memories of a stressful experience?”

Quality of Life Scale (Burakhardt, n.d.). The QOLS is a questionnaire intended to measure one’s interpretation of their quality of life. This questionnaire asks students to answer 15 multiple choice questions regarding their quality of life. There are 7 answers per question ranging from delighted to mixed to terrible. For example, “How do you feel about your health; being physically fit and maintaining a rigorous workout routine?

The Satisfaction With Life Scale (Diener et al., 1985). The Satisfaction with Life Scale measured a participant's overall feelings of comfort and satisfaction with their life. This scale asked five questions regarding the participants' satisfaction with life, measured on a likert scale, ranging from strongly disagree to strongly agree. For example, the question would state, "In most ways, my life is close to ideal." Students would then select any options from strongly disagree to strongly agree depending on how much they relate to each statement.

Healthy Eating Assessment (Healthy, n.d.). The Healthy Eating Assessment assessed a participant's eating habits. This assessment asked 10 multiple choice questions in regard to participants' eating habits. Each question varied in scale type. For example, "How many times a day did you eat fast/fried food/or packaged snacks high in fat/salt/or sugar?"

Ryff Psychological Well-being Scales (Ryff & Keyes, 1995). The Ryff measured a participant's well-being; more specifically, how they viewed or how they felt other people viewed themselves and their lifestyle. This scale asked 42 questions regarding one's well-being, on a likert scale ranging from strongly disagree to strongly agree. For example, "In general, I feel like I am in charge of the situation in which I live." There were six subscales to the Ryff which are all independently scored. The subscales included autonomy, environmental mastery, personal growth, purpose in life, positive relationships with others, and self-acceptance.

Results

Primary analyses focused on examining the relationship between exercise, healthy eating and the various mental health variables.

Test of Between-Subjects Effects

We predicted that participants who engage in both aerobic and anaerobic exercises will have the most benefits in their psychological health and well-being, including lower BDI scores, lower GAD scores, lower PCR scores, and higher Ryff psychological well-being scores. To test this hypothesis, we ran a 3 X 11 Multivariate ANOVA with exercise category (aerobic, anaerobic and both) as the between-subjects factor, and the 11 outcome questionnaires as the within-subjects factors. There was a significant difference between the 3 exercise categories for the RYFF positive relationships, F (2, 212) = 4.375, p = 0.014. A follow-up Tukey test showed that those who did both aerobic and anaerobic exercises (M = 28.21, sd = 4.66) reported significantly higher positive relationships on the RYFF compared to those who did only anaerobic exercises (M = 25.14, sd = 5.17). There were no other significant differences.

Correlations between the Healthy Eating and Psychological Well-being (RYFF)

We predicted that those who have healthier eating habits will have higher quality of life and better overall psychological well-being. To test this hypothesis, we ran a series of Pearson's Bivariate Correlations between the healthy eating questionnaire and the well-being and psychological health questionnaires. There was a significant positive correlation between healthy

eating habits and the RYFF self-acceptance, $r = .254$, $p = .001$, $n = 223$, between healthy eating and the RYFF purpose in life, $r = .163$, $p = .015$, $n = 223$, the between healthy eating and the

RYFF positive relationships with others, $r = .208$, $p = .002$, $n = 223$, between healthy eating the RYFF personal growth, $r = .208$, $p = .002$, $n = 223$, between healthy eating habits and the RYFF environmental mastery, $r = .289$, $p = .001$, $n = 223$, and between healthy eating habits and the RYFF autonomy, $r = .273$, $p = .001$, $n = 223$. Overall, these results suggest that the healthier a person eats, the greater their overall psychological well-being in all aspects of well-being.

The Healthy Eating Scale in Relation to Other Mental Health Questionnaires

We predicted that healthy eating would positively correlate with higher QOLS and satisfaction with life scores and lower GAD7 and PCL5 scores. To test this hypothesis, we ran a series of Pearson's Bivariate Correlations between the healthy eating questionnaire and the remaining mental health questionnaires. There was a significant positive correlation between healthy eating and satisfaction with life, $r = .661$, $p = .001$, $n = 232$, between healthy eating and quality of life, $r = .364$, $p = .001$, $n = 232$, between healthy eating and PTSD symptoms, $r = .289$, $p = .001$, $n = 232$, and a marginally significant positive correlation between healthy eating and anxiety, $r = .135$, $p = .041$, $n = 232$. There was no correlation between healthy eating and depression. Overall, the data indicates that healthy eating leads to an improved quality of life and greater life satisfaction.

The Number of Exercises in Relation to Psychological Well-being (RYFF)

We predicted that the more exercises a participant engages in, the higher the quality of life and better overall psychological well-being the participant will have. To test this hypothesis, we ran a series of Pearson's Bivariate Correlations between the number of exercises and six subscales of the RYFF.

There was a significant positive correlation between the number of exercises and the RYFF positive relationships, $r = .143$, $p = .03$, $n = 222$. There was also a significant positive correlation between the number of exercises and the RYFF personal growth, $r = .15$, $p = .026$, $n = 222$. Overall, these results indicate that the more exercises a person does, the greater their well-being.

The Number of Exercises in Relation to Other Mental Health Questionnaires

We predicted that the number of exercises a participant does will lead to greater scores on the GAD7, QOLS, PCL5, Beck Depression Inventory, and the Satisfaction with Life Scale. To test this hypothesis, we ran a series of Pearson's Bivariate Correlations between the number of exercises and the mental health questionnaires. There were no significant correlations found.

The Months and Years of Gym Attendance in Relation to Other Psychology Questionnaires

We predicted that the time spent at the gym will lead to greater scores on the GAD7, QOLS, PCL5, Beck Depression Inventory, and the Satisfaction with Life Scale. To test this hypothesis, we ran a series of Pearson's Bivariate Correlations between the months and years of gym attendance and mental health questionnaires. There was a marginally significant negative correlation between the months and years of gym attendance and anxiety, $r = -.122$, $p = .001$, $n =$

220. This indicates that the longer you've been exercising, the less anxiety symptoms you display.

Discussion

This research focused primarily on the different effects of aerobic and anaerobic exercises on aspects of well-being, healthy eating, anxiety, and depression. The results partially supported our hypotheses in that both types of exercises, as well as healthy eating, gave rise to better overall psychological well-being and mental health but indicated no significant difference between aerobic and anaerobic exercises.

We hypothesized that participants who engaged in both aerobic and anaerobic exercises would have the most benefits in both their psychological health and well-being, including lower BDI scores, lower GAD scores, lower PCR scores, and higher Ryff psychological well-being scores. We found significant results for the RYFF positive relationships. As stated by Taylor (2020), both aerobic and anaerobic exercises have been found to increase one's overall mood through increased group socialization, and our results support the significance of exercising for positive relationships. Also, aerobic and anaerobic exercises fulfill different physical and psychological needs of different people. We found that when both these types of exercises are used in conjunction, it yields a higher positive relationship on the RYFF than when compared to those who only did anaerobic exercises or aerobic exercises.

Second, we hypothesized that those who have healthier eating habits will have a higher quality of life and better overall psychological well-being. There were significant positive correlations between healthy eating habits and all subscales of the RYFF - self-acceptance, purpose in life, positive relationships, personal growth, environmental mastery, and autonomy. Brown (2018) stated that healthy eating, in conjunction with exercise can improve various aspects of one's life. Even if weight loss or weight gain did not occur, there were notable signs of

improvement (Brown, 2018). Improvements in self-esteem, cognitive functioning, sleep quality, energy levels, and physical functioning were all found to be a product of healthy eating and exercise (Brown, 2018), thus it is not surprising that healthy eating correlates positively with overall psychological well-being in almost all areas of well-being.

Third, we predicted that healthy eating would positively correlate with higher QOLS and satisfaction with life scores and lower GAD7 and PCL5 scores. There was a positive correlation between healthy eating and satisfaction with life. The reduced levels of stress, anxiety, and depression due to increased levels of exercise and healthier eating can lead to an overall improved judgment of one's life (Eating Well, n.d.), which may explain the positive correlations we found between quality of life, life satisfaction, and healthy eating. By eating healthier foods in conjunction with aerobic and anaerobic exercises, various physiological and psychological factors are improved, thereby improving one's quality of life (Brown, 2018). A significant positive correlation between healthy eating and PTSD symptoms was also found. As stated by Wier, 2011, people who regularly exercise are less likely to experience feelings of panic or other similar fight-or-flight scenarios. By exercising and having healthier eating habits, feelings of panic and anxiety may reduce, particularly in those with PTSD. However, given that we found a positive correlation between PTSD symptoms and healthy eating, it may be that students who experience PTSD are currently undergoing therapy for their symptoms, and therefore focus more on healthy eating and exercising than those with less or no PTSD symptoms.

There was no significant correlation found between healthy eating and depression, and there was a marginally significant correlation found between healthy eating and anxiety. We are not sure why this correlation was found.

When comparing the number of exercises in relation to psychological well-being (RYFF), we predict that the more exercises that are done, the higher quality of life and better overall psychological well-being the participant will have. There was a significant positive correlation between the number of exercises done and RYFF positive relationships. Jarbin's (2021)14-week aerobic program demonstrated that, with consistent exercise, one can have an improved quality of life (Jarbin et al., 2021). Taylor (2020) also stated that through exercise, one can become more socialized. Therefore, by exercising over an increased period, one can become more socialized and create more significant relationships. A significant positive correlation was also found between the number of exercises done and RYFF personal growth. It may be that more exercise improves quality of life (Jarbin et al., 2021), which then leads to greater personal growth. In fact, Taylor (2020) showed that aerobic and anaerobic exercise training is linked to higher levels of self-efficacy.

Finally, we examined the correlation between the months and years of gym attendance in relation to mental health and found that there was a marginally significant negative correlation between months and years of gym attendance and anxiety. Jarbin's study of elongated, high intensity training demonstrated that practice and experience in fitness settings lead to an overall improved quality of life (Jarbin, 2021). Furthermore, research conducted by Taylor (2020), "Exercise for mood, anxiety, and well-being" (2018), Strickland and Smith (2014), and Kianian (2018) all found that levels of stress and anxiety are reduced through repeated exposure to exercise.

Limitations and Future Directions

This study examined aerobic and anaerobic exercise in relation to anxiety and depression. While this study was successful in finding various significant results, there are also various limitations that must be noted. Firstly, this study was correlational, not causational. While various correlations were found, there was no data or results suggesting that aerobic and anaerobic exercise can cure anxiety and depressive disorders. Second, the Exercise History and Attitudes Questionnaire could not be scored. While the questionnaire was beneficial, the data could not be used due to a retired scoring system, which we were not aware of until the authors were contacted. Third, all our participants were college students, limiting the generalizability of our findings to individuals of this age group.

Despite these shortcomings, we have found significant evidence in favor of aerobic and anaerobic exercise as well as healthy eating being used as a supplemental treatment for anxiety and depression. Aerobic exercise has been found to have an overall increased likelihood of reducing both anxiety and depressive symptoms when compared to anaerobic exercise, but this research shows that exercise in all forms depending on one's preference, as well as healthy eating, are effective ways of managing mental health symptoms.

References

5 ways aerobic and anaerobic exercises are different, and why you need both. Canadian Chiropractic Association (CCA) - Association chiropratique canadienne. (2019, May 2). Retrieved April 12, 2022, from https://chiropractic.ca/blog/5-ways-aerobic-and-anaerobic-exercises-are-different-and-why-you-need-both/

Aerobic exercise is an effective treatment for depression. NIHR Evidence. (2022, April 6). Retrieved April 21, 2022, from https://evidence.nihr.ac.uk/alert/aerobic-exercise-is-an-effective-treatment-for-depression/

Beck , A. (n.d.). *Beck's depression inventory - ismanet.org*. Beck's Depression Inventory. Retrieved March 29, 2023, from https://www.ismanet.org/doctoryourspirit/pdfs/Beck-Depression-Inventory-BDI.pdf

Brown , R. (2016, April 18). *How diet and exercise improve your quality of life*. Next Avenue. Retrieved March 29, 2023, from https://www.nextavenue.org/how-diet-and-exercise-improve-your-quality-of-life/

Burckhart, Woods, Shultz, & Ziebarth. (1989). *Instructions for scoring the quality of life scale this ... - contentedits*. Instructions for Scoring the Quality of Life Scale. Retrieved March 29, 2023, from http://www.contentedits.com/img.asp?id=13179

Colarossi , Jessica. “Mental Health of College Students Is Getting Worse.” Boston University, 21 Apr. 2022, https://www.bu.edu/articles/2022/mental-health-of-college-students-is-getting-

worse/#:~:text=They%20found%20that%20the%20mental,criteria%20for%20one%20or%20more.

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction with Life Scale. Journal of Personality Assessment, 49, 71-75

Eating Well for Mental Health. Sutter Health. (n.d.). Retrieved March 29, 2023, from https://www.sutterhealth.org/health/nutrition/eating-well-for-mental-health

Exercise for Mood, Anxiety, & Well-Being. Exercise for mood, anxiety, & well-being. (2018, June 22). Retrieved March 30, 2022, from https://caps.ucsc.edu/resources/exercise.html#:~:text=Aerobic%20and%20anaerobic%20exercise%20have,depressive%20symptoms%20just%20following%20exercise

Exercise history and attitude questionnaire - american council on exercise. Exercise History and Attitude Questionnaire . (2015). Retrieved March 29, 2023, from https://www.acefitness.org/cmes-resources/pdfs/02-04-CMES-ExerciseHistoryAttitude.pdf

Giardino , N. D., Friedman , S. D., & Dager, S. R. (2007). Anxiety, respiration, and cerebral blood flow: implications for functional brain imaging. UCF Library . Retrieved March 24, 2022, from https://ucf-flvc.primo.exlibrisgroup.com/discovery/fulldisplay?docid=cdi_pubmedcentral_primary_oai_pubmedcentral_nih_gov_1820771&context=PC&vid=01FALSC_UCF%3AUCF&lang=en&search_scope=MyInst_and_CI&adaptor=Primo+Central&tab=Everything&query=any%2Ccontains%2Canxiety%2CAND&mode=advanced&offset=0

Heijnen, Saskia, et al. “Neuromodulation of Aerobic Exercise—a Review.” Frontiers in Psychology, vol. 6, 2016, https://doi.org/10.3389/fpsyg.2015.01890

Healthy eating assessment - gov. Healthy Eating Assessment . (2017). Retrieved March 29, 2023, from https://www.hss.gov.nt.ca/sites/hss/files/resources/healthy-eating-assessment.pdf

Jarbin , H., Hoglund, K., Skarphedinsson, G., & Bremander , A. (2021). Aerobic exercise for adolescent outpatients with persistent major depression: Feasibility and acceptability of moderate to vigorous group exercise in a clinically referred sample, doi: 10.1177/13591045211000782, UCF Library . Retrieved March 22, 2022, from https://ucf-flvc.primo.exlibrisgroup.com/discovery/fulldisplay?docid=cdi_swepub_primary_oai_lup_lub_lu_se_52aaae81_952e_4e22_9de6_927b7428c502&context=PC&vid=01FALSC_UCF%3AUCF&lang=en&search_scope=MyInst_and_CI&adaptor=Primo+Central&tab=Everything&query=any%2Ccontains%2Cdepression%2CAND&mode=advanced&offset=0

Kianian , T., Kermansaravi , F., Saber, S., & Aghamohamadi, F. (2018). The Impact of Aerobic and Anaerobic Exercises on the Level of Depression, Anxiety, Stress and Happiness of Non-Athlete Male. UCF Library. Retrieved March 23, 2022, from https://ucf-flvc.primo.exlibrisgroup.com/discovery/fulldisplay?docid=cdi_openaire_prim

Rashidi, M., Rashidypour, A., Ghorbani , R., Diyanat, H., & Shahvaranian, M. (2017). The comparison of aerobic and anaerobic exercise effects on depression and anxiety in students. Retrieved March 22, 2022, from https://ucf-flvc.primo.exlibrisgroup.com/discovery/fulldisplay?docid=cdi_doaj_primary_oai_doaj_org_article_d9935237d6bd4ef68307d5352a31713e&context=PC&vid=01FALSC_UCF%3AUCF&lang=en&search_scope=MyInst_and_CI&adaptor=Primo+Central&tab=Everything&query=any%2Ccontains%2Canxiety%2CAND&mode=advanced&offset=0

Ryff, & Keyes. (2014). *Psychological wellbeing scale*. SPARQtools.org. Retrieved March 29, 2023, from https://sparqtools.org/mobility-measure/psychological-wellbeing-scale/

Spitzer, R., Williams, J., & Kroenke, K. (1999). *Anxiety and depression association of america*. GAD-7 Anxiety . Retrieved March 29, 2023, from https://adaa.org/sites/default/files/GAD-7_Anxiety-updated_0.pdf

Strickland, J. C., & Smith, M. A. (2014, July 10). The anxiolytic effects of resistance exercise. Frontiers in psychology. Retrieved April 21, 2022, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4090891/

Taylor, S. E. (2020). Health Psychology (11th Edition). McGraw-Hill Higher Education (US). https://yuzu.vitalsource.com/books/9781260834338

Weathers, Litz, Keane, Plamieri, Marx, & Schnurr. (2018, April 18). *PTSD Checklist for - veterans affairs*. PTSD Checklist for DSM-5 (PCL-5). Retrieved March 29, 2023, from https://www.ptsd.va.gov/professional/assessment/documents/PCL5_Standard_form.PDF

Weir, K. (2011, December). The exercise effect. Monitor on Psychology. Retrieved April 12, 2022, from https://www.apa.org/monitor/2011/12/exercise

Appendix A

Simple Bar Mean of Ryff Positive Relations by Types of Exercise

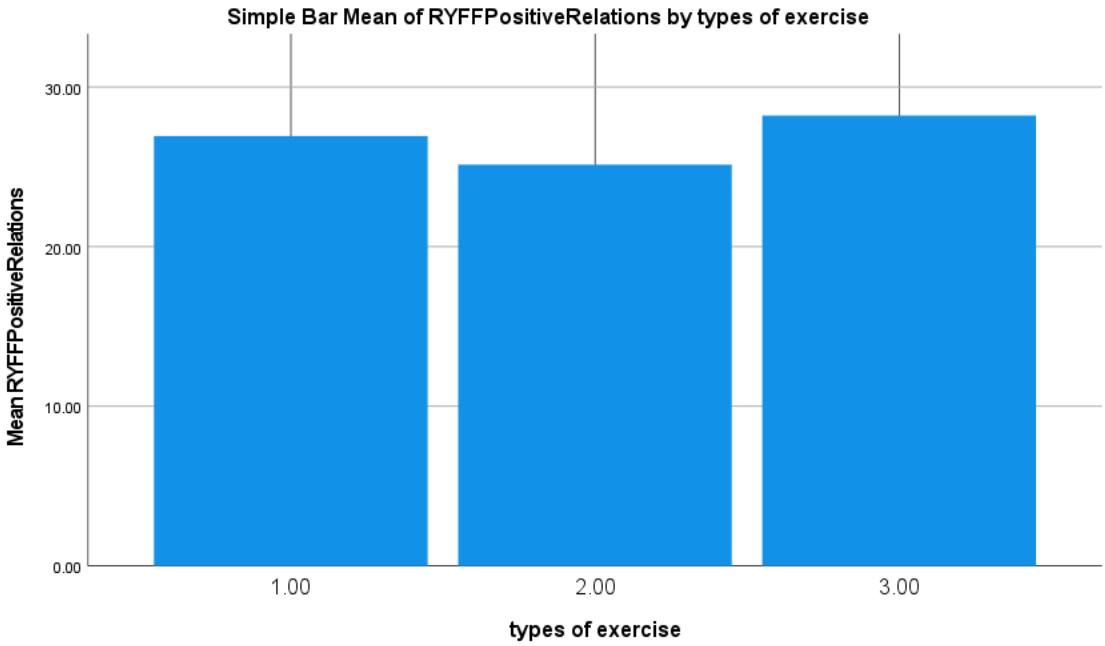

Figure 1 shows the relationship between Ryff Positive Relations and Types of Exercise

Appendix B

Correlation between Healthy Eating and the Ryff

	Ryff SA	Ryff PiL	Ryff PR	Ryff PG	Ryff EM	Ryff Autonomy
Healthy Eating	r = .254, p = .001	r = .163, p = .015	r = .208, p = .002	r = .208, p = .002	r = .289, p = .001	r = .273, p = .001

Figure 2 showing a significant positive correlation between Healthy Eating and various Ryff scales of well-being

Appendix C

Correlation between Healthy Eating and Psychological Questionnaires

	SwL	QOLS	PCL5	GAD7

Healthy Eating	r = .661, p = .001	r = .364, p = .001	r = .289, p = .001	r = .135, p = .041

Figure 3 showing a positive correlation between healthy eating, satisfaction with life, and quality of life, a significant positive correlation between healthy eating and PTSD symptoms, and a marginally significant correlation between healthy eating and stress

Appendix D

Correlation Between Number of Exercises and the Ryff Positive Relationships and Personal Growth

	Ryff PR	Ryff PG
Number of Exercises	r = .143, p = .03	r = .15, p = .026

Figure 4 shows a significant positive correlation between the number of exercises done and both the Ryff Positive Relations and the Ryff Personal Growth

Appendix E

Correlation between Months and Years of Gym Attendance and the GAD7

	GAD7
Months/Years of Gym Attendance	r = -.122, p = .001

Figure 5 shows a marginally significant negative correlation between months and years of gym attendance and stress symptoms