**Portfolio Project - Athletics, Mental Health, Resilience, and Loneliness: Impacts During the COVID-19 Pandemic**

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**Abstract**

The COVID-19 pandemic underscored the critical role of mental health, resilience, and social well-being, particularly in response to stress and isolation. This study explores the relationship between physical activity, athletic identity, resilience, mental health, and loneliness during the pandemic. A secondary dataset from Knowles et al. (2020), which includes survey responses from individuals in the United Kingdom, is utilized, and statistical analysis is conducted to examine differences in mental health outcomes between athletes and non-athletes, the predictive role of resilience, and the impact of social distancing on loneliness. Key findings indicate that athletes demonstrate higher resilience scores than non-athletes, and resilience is a significant predictor of mental health. However, the study indicates no substantial relationship between social distancing duration and loneliness. Further, no significant mental health differences are observed when comparing team sport athletes to individual sport athletes. These results contribute to the growing body of research on mental health and resilience, emphasizing the value of promoting physical activity as a means of developing resilience and strengthening psychological well-being. The findings provide insights for organizations, educators, and healthcare professionals in developing strategies to build resilience and mitigate mental health concerns in stressful situations.

*Keywords:* Mental health, resilience, athletic identity, loneliness, COVID-19 pandemic

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The positive impacts of exercise and physical fitness have been a focus of study for years. Although, in recent years, there has been an increasing recognition of the significance of mental health and the various factors that contribute to psychological well-being. Events like the COVID-19 pandemic, wars, and natural disasters have highlighted the negative effects of stress on mental health. Shechory Bitton & Laufer (2021) and Pisolkar et al. (2024) indicate increased psychological distress during the pandemic, underscoring the need for mental health services.

Along with known mental health disorders such as anxiety and depression, different attributes related to overall mental health have emerged more frequently in studies including factors such as resilience and loneliness. The concept of resilience and how certain individuals might have attributes that might allow them to be better equipped to manage traumatic events (see Tucker, 2021) has been a fascinating area of study. Research has examined resilience as a mediator between physical activity and mental health (Liu et al., 2024; Lin et al., 2024). This has led to research on how attributes, such as resilience, can be strengthened or further developed through physical activity and fitness to promote positive mental health outcomes (Chuang et al., 2024; Wiedenman et al., 2024).

It is important for organizations and healthcare to understand how physical activity contributes to mental health and resilience. For employers, understanding how employees can strengthen resilience for stressful situations, and therefore maintain mental health, can be of great benefit for employee performance, productivity, and service. For instance, Nashwan et al. (2024) examined the effects of resilience and loneliness on nurses, highlighting how these factors influence their job performance and subsequently affect patient care. The study underscores the critical importance of mental health for healthcare professionals.

This is also relevant to education. Xu et al. (2021) found how physical activity plays an important role in resilience for college students and helps satisfy different psychological needs. Zheng et al. (2024) investigated the impact of physical exercise on college students, concluding that physical activity serves as a method for preventing anxiety.

Moreover, with the increase in healthcare expenses, it is crucial to comprehend the relationship between mental health and overall health, as well as the total cost of care. A study conducted by Evernorth (2023) concluded that mental health conditions can aggravate physical ailments and impede medical treatment and recovery. The study also determined that patients who commenced behavioral therapy experienced overall healthcare cost savings within the first year, thereby offsetting the expenses associated with behavioral care.

An individual's mental health significantly impacts various aspects of their life, including job performance, personal success, and relationships with friends and family. Consequently, it is essential for employers, educators, government officials, healthcare professionals, and other stakeholders to prioritize mental health improvements. This project aims to investigate specific factors that may influence mental health, particularly in response to stressful situations encountered in everyday life.

Polonsky and Waller (2019) describe problem definition as the initial step in the research process, emphasizing its significance in providing focus and direction for addressing the issue. Therefore, the problem statement will be defined as follows:

Significant events (from global to individual levels) can cause great stress on individuals’ mental health which, in turn, can negatively impact different aspects of their lives (e.g., physical health, job performance, relationships). Individual traits, such as resilience, have been found to buffer against these stressful events, but methods need to be identified on how one can develop and strengthen their resilience factor, and therefore, their mental health. More specifically, can physical fitness and activity help strengthen resilience and mental health during stressful events?

**Objectives**

The objectives for this study are as follows:

* Research literature related to stressful events, physical activity, resilience, mental health, and any potential interrelationships.
* Perform statistical analysis on a given dataset taken from the COVID-19 pandemic which has information on individuals for attributes related to physical activity, athletic identity, resilience, wellbeing, depression, anxiety, and loneliness.
* Identify attribute relationships and recommend actions for impacted organizations and further research.

**Overview of Study**

This study will utilize data to analyze potential relationships between physical activity, athletic identity, mental health, resilience, wellbeing, and loneliness. The dataset was retrieved from Knowles et al. (2020). The data was collected during the backdrop of the COVID-19 pandemic as individuals in the United Kingdom were emerging from a lockdown period. Data was self-reported via survey and contained questions taken from different measurement tools including the Mental Health Continuum (Keyes, 2005), Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983), Brief Resilience Scale (Smith et al., 2008), Short Loneliness Scale (De Jong Gierveld & Van Tilburg, 2006), and Athletic Identify Measurement Scale (Brewer at al., 1993). Individuals self-identified as athletes or non-athletes along with reporting on specific sports for which they participated, and amount of time spent on such physical activities.

This study employs statistical analysis on the various attributes within this data to determine significant relationships. Comparisons are made between those engaging in sport and high levels of physical activity (i.e., athletes) and those who do not (i.e., non-athletes). Scores on attributes related to overall mental health (e.g., resilience and well-being) are measured and compared. Also, time spent in physical activity is analyzed to see if it is valuable as a significant predictor of mental health. Further, since this data was taken during the pandemic, this study adds to the literature of the relationship between physical activity and mental health by factoring in the presence of a significant stressful and global event (i.e., the COVID-19 pandemic) and its potential impact on the studied relationships.

In addition, direct consequences of the pandemic are measured and their potential on mental health attributes. Time spent social distancing is analyzed to identify if there is a significant relationship with loneliness scores. Finally, comparisons are made within the athlete group of the sample, evaluating well-being scores among those who participate in different types of sport (e.g., team sports vs. individual sports).

The results of this study are compared to previous studies in the literature to identify differences and similarities. Insights could help drive understanding into the strength of relationships between physical activity and mental health and how these relationships might endure under the presence of extreme stressful events (e.g., a pandemic).This might help educate on best methods for strengthening resilience and mental health or how strategies might need to be adjusted for extremely stressful scenarios.

**Research Questions and Hypotheses**

The following are the specific research questions being explored. For each, null and alternative hypotheses to be evaluated are proposed.

**Research Question #1: Do athletes have higher resilience scores than non-athletes?**

*Null Hypothesis (): Resilience scores are not significantly higher for athletes as compared to non-athletes.*

*Alternative Hypothesis (): Resilience scores are significantly higher for athletes as compared to non-athletes.*

**Research Question #2: What is the relationship between resilience and overall mental health?**

*Null Hypothesis (): There is no significant relationship between resilience and mental health scores.*

*Alternative Hypothesis (): There is a significant relationship between resilience and mental health scores.*

**Research Question #3: In the context of the pandemic, is there an association between the duration of social distancing and factors related to loneliness?**

*Null Hypothesis (): There is no significant relationship between number of weeks social distancing and loneliness scores.*

*Alternative Hypothesis (): There is a significant relationship between the number of weeks social distancing and loneliness scores.*

**Research Question #4: Are there differences in mental health scores during the pandemic between individual and team athletes?**

*Null Hypothesis (): There is no significant difference in mental health scores between those who identify themselves primarily as individual athletes and those who identify themselves primarily as team athletes.*

*Alternative Hypothesis (): There is a significant difference in mental health scores between those who identify themselves primarily as individual athletes and those who identify themselves primarily as team athletes.*

**Literature Review**

Physical activity and exercise offer long-term health benefits, including physical, physiological, and psychological improvements (Esteves & Lewis, 2021). Oja et al. (2015) found that specific sports improve aerobic fitness, metabolism, muscle performance, and cardiac function. Furthermore, Eime et al. (2013) noted that sports participation enhances children's and adolescents' physical health, psychological well-being, self-esteem, and reduces depression symptoms.

Awareness of mental health has increased recently. Schramme (2021) defines it as more than just the absence of illness, emphasizing psychological conditions for a fulfilling life. Positive mental health improves overall health and quality of life in those with mental disorders (Vaingankar et al., 2020). Fiorillo et al. (2023) highlight the bidirectional relationship between physical and mental health, noting that positive mental health enhances physical health.

Certain events in life can significantly increase stress levels and negatively impact mental health. The COVID-19 pandemic serves as a prime example of such an event, posing risks to both physical and mental well-being on a global scale. Research by Shechory Bitton and Laufer (2021) emphasized the heightened psychological distress experienced during the pandemic, particularly among young individuals. The pandemic adversely affected various aspects of people's lives, including finance, mood, life perspective, physical health, spirituality, and mental health (Ok et al., 2024). Pisolkar et al. (2024) noted the strain on children's mental health and the challenges in accessing essential mental health services during the COVID-19 crisis, underscoring the importance of social connectedness. Additionally, Guintella et al. (2021) identified disruptions to physical activity as a significant risk factor for depression during the pandemic.

The COVID-19 pandemic and other global events have increased interest in promoting mental health. Resilience is identified as crucial for maintaining mental well-being despite adversity. Tucker (2021) defines resilience as strength of character amidst neglect, disasters, poverty, and abuse. Studies show that resilience significantly supports mental health, with Israeli students finding it critical during wartime (Lipskaya-Velikovsky et al., 2025). Chuang et al. (2024) highlight the importance of resilience and self-compassion for positive mental health, while Hsiao et al. (2024) link lower resilience to poorer mental health.

Research suggests a link between physical activity, resilience, and mental health. Liu et al. (2024) found that physical activity improves positive affect through resilience and emotional self-efficacy. Lin et al. (2024) identified correlations between physical activity and mental health indicators, with resilience serving as a mediator.

Participation in sports increases physical activity and has been linked to positive mental health outcomes. Eather et al. (2023) reported that any form of sport benefits mental health and social outcomes for adults. Wiedenman et al. (2024) found that self-efficacy, resilience, and psychological need satisfaction from sports may support lifelong physical activity. Sheng et al. (2024) noted a positive relationship between sports participation and resilience in children and adolescents, suggesting it as a strategy for promoting mental health.

The type of sport, whether individual or team, has been studied for its impact on mental health. Eather et al. (2023) noted that while both types may be beneficial, team sports might offer additional advantages for mental and social outcomes in adults compared to individual sports. One study observed that athletes involved in team sports reported lower anxiety and depression levels than those partaking in individual sports, suggesting that social support in team environments could contribute to more positive mental health outcomes (Pluhar et al., 2019). Similarly, Eime et al. (2013) identified specific benefits from team sports due to the social aspects of participation.

However, the advantages of team sports over individual sports may not be universally applicable. A study conducted during the COVID-19 pandemic observed that athletes participating in individual sports maintained higher levels of physical activity during lockdowns compared to those engaged in team sports. This was associated with improved mental health outcomes (Casali et al., 2021). Salles et al. (2023) also stated lower mental health outcomes for team athletes during the pandemic as team athletes reported worse symptoms of insomnia and depression as compared to individual sport athletes, due to reduced social interactions being a contributor.

This introduces the concept of another attribute related to mental health: loneliness. Werner et al. (2021) found that feelings of loneliness were linked with mental health challenges during the pandemic and highlighted the importance of addressing loneliness to reduce negative outcomes. Allen et al. (2022) identified loneliness as an important predictor of declining health outcomes and behaviors. During the COVID-19 pandemic, it was found that those who were single or had a psychiatric diagnosis experienced increased loneliness with social distancing measures in place (Hoffart et al., 2020). Lampraki et al. (2022) found that emotional loneliness increased over time during the pandemic; however, social loneliness remained stable. Further, Peng and Roth’s (2022) study found that, despite increased isolation through social distancing, older adults were able to find ways to mitigate loneliness including through digital methods.

Identifying factors that affect mental health has important implications. Mental health influences physical health, well-being, performance, and life goals. Developing personal resilience significantly improves stress management, job performance, and mental well-being (Han, 2024). Ming and Nargiza (2024) found that mindfulness and resilience training boost cognitive performance and stress management in pilots. Sikharulidze et al. (2024) emphasized addressing loneliness, resilience, and stress to enhance psychological well-being and performance. These findings highlight the need for strategies to strengthen mental resilience, reduce loneliness, and promote mental health for better overall performance.

**Research Design**

The following sections describe the methodology, tools, and techniques used to perform this study. Included are description of the data being used, known limitations of the study, and considerations for ethical purposes.

**Methodology**

The data being used for this study is a secondary dataset obtained from Knowles et al. (2020). All data is in a quantifiable format taken via survey during the COVID-19 pandemic in the United Kingdom. Many of the questions on the survey were taken from past measurement tools: the Mental Health Continuum (Keyes, 2005), the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983), the Brief Resilience Scale (Smith et al., 2008), the Short Loneliness Scale (De Jong Gierveld & Van Tilburg, 2006), and the Athletic Identity Measurement Scale (Brewer et al., 1993). A significant number of the questions were answered via a scaled approach (e.g., to what extent did the individual agree with the statement where 1 = ‘Strongly Disagree’ to 5 = ‘Strongly Agree’). Then, based off the answers to specific questions, overall scores were given for certain attributes: athletic identity, mental health/well-being, anxiety and depression, resilience, and loneliness. This methodology allows for measuring attributes quantifiably and performing statistical analysis to compare attributes among different groups and explore relationships. This methodology aligns with the overall research design by enabling the statistical testing of attributes against the null hypotheses, thereby providing answers to the specific research questions proposed. This approach is consistent with how relationships have been examined in previous literature.

**Methods**

Within the data, answers to survey questions were pre-coded for greater ease of analysis. In the dataset, missing values for questions and attributes were coded with the value ‘999’. When performing statistical analysis, observations with missing values on the relevant attributes were typically omitted for the purpose of the calculations and noted as such.

The dataset was loaded into Python as a data frame, and Jupyter Notebook 7.2.2 was utilized to write code to perform further data cleaning/relabeling along with calculating summary statistics and generating data visualizations around the relevant attributes of the study. Python has the benefits of scalability and flexibility, especially in terms of its many available libraries in generating flexible and creative data visualizations (i.e., charts and graphs).

For more advanced statistical testing of hypotheses, SAS Studio was also utilized. SAS Studio is user-friendly for common statistical techniques and allows combining multiple statistics and tests in one task. It supports correlation analysis, t-tests, ANOVA, and predictive regression models. SAS Studio also helps determine assumptions about factors like the normality of distribution and homogeneity of variance to guide further statistical techniques.

For Research Question #1, descriptive statistics and distribution analysis were performed on overall resilience score for both athlete and non-athlete classes. To determine appropriate statistical test methods, various normality tests were calculated on the distributions including Shapiro-Wilk, Kolmogorov-Smirnov, Anderson-Darling, and Cramer-von Mises. The results of these normality tests helped in determining whether an independent samples one-tailed t-test (for parametric distributions) or a Wilcoxon rank-sum test (for nonparametric distributions) should be utilized to determine whether resilience scores were significantly higher for athletes than non-athletes.

For Research Question #2, descriptive statistics and histograms were generated to analyze distributions for both resilience and mental health scores. Correlation analysis was performed, and both Pearson and Spearman results were generated. In addition, a linear regression model was created to identify if weekly activity hours might be a significant predictor for mental health scores.

For Research Question #3, the number-of-weeks-social-distancing attribute was broken down into eight intervals. Distributions via boxplot and summary statistics were generated for each interval on the loneliness score. ANOVA testing allows for the testing of differences in means between multiple groups and was used to evaluate whether statistical difference occurred between loneliness scores in the different number-of-weeks-social-distancing groups. Distribution analysis contributed to determination of whether the one-way ANOVA (parametric test) or Kruskal-Wallis test (nonparametric) was used.

Finally, Research Question #4 compares team and individual athletes in terms of mental health scores. As with the other research questions, descriptive statistics, charts, and tests for normality were used to analyze distributions. These helped determine whether an independent samples t-test (parametric) or a Wilcoxon rank-sum test (nonparametric) was used to analyze differences in means between the two groups.

**Limitations**

The respondents in this study were primarily from a specific segment of the population, residing in or around the United Kingdom at the time of the survey. Therefore, geographical and cultural factors should be considered when generalizing these results to a broader population.

In addition, this survey was conducted during the COVID-19 pandemic, a unique global event. The results of this study may not be applicable to non-pandemic periods. Conducting a similar survey with the same respondents now, after the peak of the pandemic, could yield comparative insights.

Lastly, any recommendations derived from this study's findings should consider additional factors. This study evaluates the mental health attributes of individuals who identify as athletes and are very physically active. Despite potential benefits observed from these activities, certain demographic and socioeconomic factors may limit or restrict portions of the population from participating in specific sports or physical activities. Furthermore, physical disabilities, medical conditions, or genetic predispositions may prevent some individuals from engaging in physically rigorous activities. Therefore, these variables must be considered when applying these findings to the general population.

**Ethical Considerations**

All data within the dataset was anonymized with no personally identifiable information inherent within the analyzed data. All participants in the survey were over 18 years of age and provided confirmation as such. All participants acknowledged reading and understanding the research project information. All survey participants confirmed that they had the opportunity to ask questions about the research project. All survey participants were informed that their involvement was completely voluntary and that they could leave the study at any time without providing any explanation or reason. All participants from the survey analysis confirmed their agreement to take part in the research study and granted permission to the researchers that their anonymous data could be used as seen fit, including for publication. There was a total of five survey respondents who elected that either they did not wish to continue, or they determined they did not meet eligibility criteria; none of these respondents’ information was used in the study for any sort of analysis.

**Findings**

Research Question #1 examines whether significant difference exists in resilience scores between athletes and non-athletes. Figure 1 displays boxplots and summary statistics for both groups on resilience scores. The mean score for athletes (21.34) is 0.86 points higher than the mean score for non-athletes (20.48). Skewness for both groups indicate slightly left-skewed distributions; however, both skewness and kurtosis are within acceptable ranges, suggesting both distributions are close to normal.

**Figure 1**

*Boxplots and Summary Statistics for Resilience Scores by Athletes and Non-Athletes*

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Additional tests for normality were performed. Figure 2 shows the results of the Shapiro-Wilk, Kolmogorov-Smirnov, Cramer-von Mises, and Anderson-Darling tests. All indicate non-normality with p-values less than 0.05. However, despite mild deviations from normality, Central Limit Theorem (CLT) indicates the t-test can still be appropriate if there are large samples. Therefore, with relatively large sample counts for each group (322 and 339, respectively) and relatively small skewness and kurtosis values, the t-test was still used as an appropriate measure to compare differences in means between the two groups.

**Figure 2**

*Tests for Normality of Resilience Score Distributions by Athletes and Non-Athletes*

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Figure 3 displays the results of running a two-sample t-test on resilience score between athletes and non-athletes. An upper one-tailed test was utilized since the hypothesis revolved around resilience score being significantly higher for athletes. The Equality of Variances test showed a value of 0.39, indicating no significant difference in variances. Both the Pooled and Satterthwaite t-tests had values less than 0.05. This indicates that athletes do have significantly higher resilience scores than non-athletes. Therefore, the null hypothesis that resilience scores for athletes are not significantly higher than non-athletes is rejected.

**Figure 3**

*T-test Results Comparing Athletes and Non-Athletes on Resilience Score*

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Research Question #2 examines whether a relationship exists between resilience and mental health scores. Figure 4 displays histograms and summary statistics to explore distributions on both features. The distribution of resilience shows a slight left skew (-0.39) while the mental health score distribution shows a slightly more left skew (-0.51); however, both remain relatively normal.

**Figure 4**

*Histograms and Summary Statistics for Resilience and Mental Health Scores*

A graph of resilience scores and mental health

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Figure 5 shows the results of correlation analysis between resilience and mental health. Both Pearson and Spearman methods show a significant relationship with p-values below 0.0001. Both show a moderate positive correlation between resilience and mental health. The Pearson correlation has a value of 0.50 while the Spearman test shows a similar result of 0.47.

**Figure 5**

*Correlation Analysis of Mental Health and Resilience Scores*

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Figure 6 graphs a scatter plot for the two variables and indicates the moderate positive relationship between them. The 95% prediction ellipse shows where most points fall; however, the points outside the ellipse also highlight moderate variability.

**Figure 6**

*Scatter Plot of Mental Health Score and Resilience*

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Figure 7 highlights the results of linear regression analysis to examine whether resilience is a significant predictor of mental health. The p-value less than 0.0001 indicates that resilience is a significant predictor. The R-square value states that resilience accounts for 25% of the variability in mental health. This is a relevant amount and shows that resilience plays a significant role in mental health; however, it also highlights that there are other factors that account for variability as well.

**Figure 7**

*Linear Regression – Resilience as Predictor of Mental Health*

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Figure 8 graphs residual and the fit plots for the regression model. The residuals show no clear pattern, indicating a linear relationship. Overall, both the correlation analysis and regression testing indicate significant relationships between the two variables. Therefore, Research Question #2’s null hypothesis that there is no significant relationship between resilience and mental health is rejected.

**Figure 8**

*Residuals and Fit Plot for Linear Regression Model*

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Research Question #3 examines whether there are significant differences in loneliness scores between groups who have experienced different time intervals of social distancing. Figure 9 shows boxplots and summary statistics on the different intervals. The 1–3-week group has lowest loneliness average at 1.75; however, all other groups have similar mean scores between 2.4 and 2.9. Skewness is positive for all groups with most being slight and others having more skewness. Kurtosis is negative, suggesting flatter distributions compared to a normal curve.

**Figure 9**

*Boxplots and Summary Statistics of Loneliness by Number of Weeks Social Distancing*

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A one-way ANOVA test was ran comparing the different weeks social distancing intervals on loneliness scores. Figure 10 displays the results of Levene’s Test. The p-value of 0.71 indicates the assumption of homogeneity of variances is met.

**Figure 10**

*Levene’s Test for Homogeneity of Variance on Loneliness Scores*

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Figure 11 shows the primary ANOVA test results. The p-value of 0.77 indicates no statistically significant difference in loneliness scores across the different groups. Further, the R-square suggests that only 0.63% of the variability in loneliness can be explained by the number of weeks social distancing. Regarding Research Question #3, this results in failing to reject the null hypothesis that there is no significant relationship between number of weeks social distancing and loneliness scores.

**Figure 11**

*One-way ANOVA Test – Loneliness among Different Intervals for Weeks Spent Social Distancing*

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Research Question #4 analyzes whether there are significant differences in mental health scores between individual and team athletes. Figure 12 graphs boxplots and summary statistics on mental health scores for both individual and team athletes. Individual athletes show a slightly higher mean score (44.64) than team athletes (42.26). Both groups have slight-to-moderate left skewness.

**Figure 12**

*Boxplots and Summary Statistics on Mental Health for Individual and Team Athletes*

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Further tests for normality were conducted (see Figure 13). All tests (Shapiro-Wilk, Kolmogorov-Smirnov, Cramer-von-Mises, and Anderson-Darling) have p-values less than 0.02, suggesting non-normality for both groups. Given the results of the normality tests and the smaller samples for both groups (n < 200), the Wilcoxon rank-sum test was run to compare differences between means.

**Figure 13**

*Tests for Normality – Mental Health for Individual and Team Athletes*

Screens screenshot of a test results

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Figure 14 displays the results of the Wilcoxon rank-sum test to compare differences in mental health scores between individual and team athletes. The p-value of 0.14 (p > 0.05) indicates that differences in mental health scores between individual and team athletes were not statistically significant. Therefore, there is failure to reject the null hypothesis from Research Question #4 that there is no significant difference in mental health scores between individual and team athletes.

**Figure 14**

*Wilcoxon Rank-Sum Two-Sample t-Test Results – Mental Health for Individual and Team Athletes*

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**Conclusion**

The findings of this study provide valuable insights into the potential relationships between physical activity, resilience, and mental health, particularly during the backdrop of a stressful global event, the COVID-19 pandemic. Testing hypotheses of Research Question #1 revealed participants identified as athletes had significantly higher scores for resilience in comparison to non-athletes. Since athletes naturally engage in high levels of physical activity, this contributes to research from Liu et al. (2024) and Lin et al. (2024) who found relationships between physical activity, resilience, and mental health. The findings also support Eather et al. (2023), Wiedenman et al. (2024, and Sheng et al. (2024) who found positive relationships between sport activity and positive mental health outcomes. Further, the findings add logic to the study by Guintella et al. (2021) which found that disruptions to physical activity was a significant risk factor to poor mental health outcomes during the pandemic.

The findings from Research Question #2 testing revealed that resilience had a significantly positive correlation with overall mental health. Through regression testing, it was also found to play a significant role as predictor variable. Although resilience only accounted for a limited amount of variance in mental health, the positive relationship indicates it as a relevant factor. This contributes to research by Chuang et al. (2024) and Hsiao et al. (2024) who examined the importance of resilience and found how low resilience could lead to more negative mental health outcomes. Occurring in the backdrop of a traumatic event such as the pandemic, it also supports the study by Lipskaya-Velikovsky et al. (2025) who identified resilience as critical to mental health during wartime.

This study also explored the effect of social distancing time on loneliness through Research Question #3. Surprisingly, the analysis did not show significant differences in loneliness scores across different durations of social distancing. Although past research reports that feelings of loneliness were heightened during the pandemic and contributed to negative mental health outcomes (Werner et al., 2021; Allen et al., 2022), the results of this study indicate that other factors beyond social distancing might have influenced individuals’ feelings of loneliness. Further, individuals may have found ways to mitigate ways to reduce the impact of social distancing on loneliness such as using technology to interact socially (Peng & Roth, 2022).

Finally, Research Question #4 looked at comparisons between individual and team athletes, and unexpectedly, showed no significant difference in mental health scores. While previous research has suggested that team sports may provide greater social support and mental health benefits (see Eather et al., 2023; Pluhar et al., 2019; Eime et al., 2013), the unique context of the pandemic may have altered these dynamics, potentially affecting the social interactions and support systems typically associated with team sports. Any mental health benefits of team sports may have been nullified during the pandemic due to forced isolationism. This idea is supported by research from Casali et al. (2021) and Salles et al. (2023) who reported lower mental health outcomes for team athletes during the pandemic.

Overall, the results underscore the complex interplay between physical activity, resilience, and mental health. The significant association between resilience and mental health highlights the importance of developing strategies to enhance resilience, particularly during periods of widespread stress and disruption. Further, while participation in sports and physical activities can be a method to build resilience, additional factors also play a role in maintaining overall mental health.

**Recommendations**

Based on the results of this study, it is recommended that schools, workplaces, and community organizations embrace and encourage participation in physical and athletic activities as a method to build resilience and improve positive mental health outcomes. However, programs should be inclusive, accessible, and adaptable to accommodate all sorts of individuals with different ages, abilities, cultures, and socioeconomic backgrounds. Further, extra consideration should be given to individuals who might have physical disabilities or other physical limitations that might limit their participation in such physical or athletic activities. Creative or indirect methods of participation should be considered along with alternative ways to develop resilience and foster positive mental health outcomes. These can include programs teaching strategies for managing stress, enhancing emotional regulation, and maintaining mental well-being.

Organizations should also develop programs to impact other factors related to overall mental health outcomes in addition to resilience. One such factor is loneliness. Organizations should sponsor initiatives that foster social connectedness, mitigate effects that contribute to loneliness, and support individuals during times of crisis. These initiatives might include social support and counseling services, teambuilding activities, and investments in new technologies that support social interactions.

Further research should include studies identifying what specific components of physical and athletic activities might contribute to resilience development. Identifying these components might help in creating resilience building programs where sports or athletics are not ideal or possible. In addition, research should be completed into what other factors outside of resilience contribute to overall mental health. Also, it is recommended that studies focus on factors that are primary contributors to feelings of loneliness.

Finally, studies like this one should be applied to different scenarios and settings. For example, it would be interesting to compare mental health studies that occurred during the pandemic to both pre-pandemic and post-pandemic studies. Examinations of how factors weigh differently on mental health during unique conditions could provide insights into how lifestyles and support services should be adapted to promote positive mental health during stressful conditions (e.g., a pandemic). Through further research and implementation, researchers and organizations can help promote positive mental health and resilience, thereby improving quality of life and performance, both personally and professionally.

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