The Relationship of Physical Activity to Anxiety and Resilient Coping Among Higher Education Employees

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ABSTRACT

Background: Physical activity (PA) can positively affect mental health, yet many aspects of this relationship (degree of effectiveness across populations and conditions, biological mechanisms, etc.) remain unexplored.
Aim: This study seeks to understand how PA is associated with anxiety, a common mental health condition, and resilient coping, the ability of an individual to overcome personal stress; and, how PA can be utilized to alleviate anxiety and strengthen resilient coping.
Methods: Data collected from Health Assessment surveys assessed how several types of PA (moderate, vigorous, moderate-to-vigorous, and strength training) are related to anxiety and resilient coping.
Results: Analysis revealed statistically significant relationships between PA and anxiety and PA and resilient coping. The findings from this study establish positive associations between PA and anxiety and resilient coping, emphasizing the powerful influence of PA as a mental health therapeutic. Such results suggest that PA could become a key component for attenuating mental health crises of workforces within higher education institutions.
Conclusion: These findings serve as convincing evidence that organizations should assess ways to incorporate PA into their policies and programs for the health and well-being of employees, namely those of higher education institutions.

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Background

An extensive amount of empirical evidence elucidates the comprehensive benefits of regular physical activity (PA) on a variety of personal health factors, such as chronic health conditions, morbidity, and health-related expenditures (Mahindru et al., 2023). Likewise, the association between PA and mental health has been thoroughly investigated, particularly in recent years, demonstrating that regular PA can confer improvements in mental health and well-being (Mahindru et al., 2023).

The prevalence of anxiety has increased in recent years. According to the National Institutes of Health, anxiety, a common mental health condition, may cause physical symptoms like sweating, a rapid heartbeat, and feelings of fear,

agitation, and dread. Approximately 34% of the United States population has experienced anxiety during their lifetime (Szuhany & Simon, 2022). Treatment for acute versus chronic anxiety differs. Traditionally, benzodiazepines, a class of prescription drugs which interact with gamma-aminobutyric acid receptors, inhibit neurotransmitters to elicit sedative and anxiolytic effects (Edinoff et al., 2021) for acute anxiety symptoms. Whereas more chronic anxiety may require the combination of both medications and psychotherapies (Chand, 2023). However, due to an increased incidence of anxiety, there is an emerging interest in using nontraditional and adjunctive modalities, such as PA, as standalone treatments or in combination with traditional medication treatments. PA has been shown to reduce symptoms and severity of anxiety among both men and women, and there may be several neurological and psychological pathways that contribute to this protective response (Anderson & Shivakumar, 2013; Aylett et al., 2018; Svensson et al, 2021). Of the possible neurological mechanisms, the hypothalamic-pituitary-adrenal axis has displayed compelling results for its link to both anxiety and depression (Anderson & Shivakumar, 2013). Imbalances of the hormones involved in this physiological pathway, like adrenocorticotropic hormone and cortisol, impairs the ability to adaptively react to external stressors, thus eventuating anxious or depressive emotions (Anderson & Shivakumar, 2013). PA has been shown to impact the release and uptake of these neuromodulators, thereby affecting anxiety and depressive manifestations (Anderson & Shivakumar, 2013). Alternatively, PA may produce psychological responses through heightened self-efficacy, indicating that an individual's self-worth is intricately tied to their belief of possessing the capacity to execute behaviors necessary to produce specific performance attainments (Bandura, 1997). PA gives an individual the opportunity to attain "self-mastery" (Anderson & Shivakumar, 2013) and bolster feelings of accomplishment and self-worth, thereby lowering feelings of anxiety. These two pathways, whether neurological or psychological, validate the tangible suppressive effects that PA can have on anxiety.

Resilient coping, described as the ability of an individual to overcome personal stress and reestablish a sense of well-being, is an influent of mental health that may be affected by PA (Lancaster & Callaghan, 2022). Though an important psychological skill itself, resilience is also an indicator of several other mental health measurements (Antonini Philippe et al., 2021). Low resilience has been associated with elevated levels of anxiety and depression, which can vary by sociodemographic factors (Antonini Philippe et al., 2021). Similar to anxiety, evidence shows a strong positive correlation between exercise intensity and resilience, indicating that not only is there a measurable benefit, but that the benefit can be controlled (Lancaster & Callaghan, 2022). Relevantly, those who engage in PA regularly are better able to cope with stressful triggers than those who do not regularly perform PA, signifying that PA consistency can influence resilient coping skill strength (Childs & de Wit, 2014).

Mental health can have significant effects and burdens on both individuals and entire workforces. Absenteeism, burnout, and low productivity are among the effects that declining mental health can have on a workplace, producing notable economic consequences for companies (Bubonya et al., 2017). The World Health Organization (2022) estimates that in 2019, 15% of adults suffered from a mental disorder and that low productivity levels due to depression and anxiety can cost the global economy upwards of one trillion U.S. dollars annually. The surge of mental health conditions has significantly impacted employers in recent years, therefore the importance of identifying and implementing protective measures against these conditions is necessary to improve the mental health of employee populations.

The current study used survey data to identify the relationship between types of PA (moderate, vigorous, moderate-to-vigorous, and strength training) to anxiety and resilient coping. The strength of the results further elucidates the potential for PA to function as a preventative therapeutic against anxiety and bolster the protective

effects of strong resilient coping. Furthermore, the results highlight the need for larger bodies of data and further research in the field.

METHODS

Study Design

This quantitative study used data obtained through a 2022 Health Assessment (HA) survey questionnaire administered by a public research University in the southeastern United States with a comprehensive employee well-being program. HA surveys are administered on a yearly basis and pull from the University employee population at-large, including their spouses and dependents, generating diverse respondent demographics. Statistical analysis was performed using SAS software, Version 9.4 of the SAS System for Windows.

Variables and Population

Using self-reported responses from the HA questionnaire, sixteen variables of interest were extrapolated that are divided into five categories: demographic characteristics (gender and race), PA (moderate, vigorous, and moderate-to-vigorous), strength training, anxiety, and resilient coping. Moderate activity, vigorous activity, and strength training were self-defined within the HA questionnaire, while moderate-to-vigorous PA (MVPA) was calculated by summing moderate activity and the double of vigorous activity (MVPA = moderate + vigorous*2). Subsequently, all non-demographic variables were re-coded dichotomously for chi-squared and logistic regression analyses. PA and strength training variables were coded as sufficient/insufficient according to Centers for Disease Control and Prevention guidelines and anxiety and resilient coping skills were coded as yes/no according to the Generalized Anxiety Disorder 2-item (GAD-2) and the Brief Resilient Coping Scale (BRCS) scale requirements, respectively. Specifically, moderate PA and MVPA were considered sufficient if the responded completed 150 or more minutes of activity; vigorous PA was considered sufficient if the respondent completed 75 or more minutes of activity; and, strength training was considered sufficient if the respondent completed 2 or more days of training. For all categories, if the respondent did not meet these requirements the data was coded as insufficient. In total, there were 8,045 respondents in this study: 6,948 employees, 1,087 spouses, and 10 dependents.

Data Analysis

Using SAS 9.4, the data was re-coded into numerical variables that were then used in the following commands: *proc corr* (Cronbach Alpha), *proc freq* (demographic frequencies, prevalence, 95% confidence intervals [CI], Rao-Scott Chi Squares, *p*-values, and prevalence ratios), and *proc logistic* (binary logistic regression).

Ethical Considerations

Common practices for the responsible use of data were followed, including analytic guidance by the National Center for Health Statistics. All HA survey data was de-identified and there were no additional efforts to identify respondents

throughout the duration of the project. This study was considered a program evaluation, and thus was exempt from Institutional Review Board review.

RESULTS

Demographics

Table 1 shows demographic trends of the respondent population, broken down by gender and race. In total, there were 8,045 survey responses and the gender split favored females to males (*n* = 5377 [66.85%] versus *n* = 2668 [33.16%]). The majority of participants were White (*n* = 6074 [75.50%]), with the second highest percentage being Asian (*n* = 724 [9.00%]), and third highest being Black African or Caribbean (*n* = 722 [8.97%]). A combined 3.53% (*n* = 284) of the population either preferred to not list their race or did not complete the question.

Table 1

Respondent Cohort Demographics

Demographics	Total responses = 8045	
	n	%
Gender		
Male	2668	33.16
Female	5377	66.84
Race		
White	6074	75.50
Hispanic Latina or Latino	173	2.15
Black African or Caribbean	722	8.97
Indigenous or First Nations	10	0.12
Middle Eastern or North African	47	0.58
Pacific Islander	11	0.14
Asian	724	9.00
I prefer not to answer	252	3.13
Not listed	32	0.40

Table 2 further dissects these demographic trends into subsamples of those with anxiety symptoms, measured by the GAD-2 scale, and those with low resilient coping skills, measured by the BRCS scale. Eleven percent (*n* = 912) of respondents tested as having anxiety symptoms, while 24.88% (*n* = 1985) tested as having low resilient coping. It is noteworthy that Black African or Caribbean respondents were second highest in both subsamples even though they were third highest in overall demographics.

Table 2

Prevalence of Demographics and Descriptive Data

Demographics	Subsample with Anxiety Symptoms		Subsample with Low Resilience Coping	
	n = 912	% = 11.33	*n* = 1985	% = 24.88
Gender				
Male	203	2.52	668	8.37
Female	709	8.81	1317	16.51
Race				
White	731	9.09	1445	18.11
Hispanic Latina or Latino	26	0.32	47	0.59
Black African or Caribbean	71	0.88	211	2.64
Indigenous or First Nations	1	0.01	1	0.01
Middle Eastern or North African	7	0.09	8	0.10
Pacific Islander	3	0.04	3	0.04
Asian	48	0.60	193	2.42
I prefer not to answer	23	0.29	75	0.94
Not listed	2	0.02	2	0.03

Mental Health Measurements

Cronbach Alpha

Both scales used within this study (GAD-2 and BRCS) were tested for internal consistency through Cronbach Alpha tests. The GAD-2 scale scored $\alpha = 0.81$ and the BRCS scale scored $\alpha = 0.77$, indicating high reliability among both scales.

Anxiety

Table 3 highlights the prevalence, chi-square values, *p*-values, and prevalence ratios for anxiety based on multiple measurements of PA (moderate, vigorous, moderate-to-vigorous, and strength training). All four measures of PA resulted in statistically significant *p*-values ($p = <.0001$) and MVPA yielded the highest chi-squared value ($\chi^2 = 103.49$).

Table 3

Prevalence of Clinically Significant Anxiety Symptoms based on Physical Activity

Physical Activity	Anxiety Symptoms (%)		Chi-square	*p*-value	Prevalence ratio (95% CI)
	Yes	No			
Moderate					
Sufficient	2.25	24.62	25.83	<.0001*	1.48 (1.27, 1.73)
Insufficient	9.09	64.04			
Vigorous					
Sufficient	5.61	58.02	89.23	<.0001*	1.79 (1.58, 2.02)
Insufficient	5.73	30.65			
MVPA					
Sufficient	6.40	64.48	103.49	<.0001*	1.10 (1.07, 1.12)
Insufficient	4.93	24.19			
Strength Training					
Sufficient	4.13	42.80	45.76	<.0001*	1.06 (1.04, 1.07)
Insufficient	7.21	45.86			

Note. MVPA = moderate-to-vigorous physical activity.

*$p < 0.05$.

The logistic regression analysis in Table 4 generates a deeper understanding of the relationship between PA and anxiety. Similarly, this analysis yielded statistically significant *p*-values ($p = <.0001$) for both MVPA and strength training and further analyzed the effect variables within each category.

Table 4

Logistic Regression of Clinically Significant Anxiety Symptoms based on Moderate-to-vigorous Physical Activity (MVPA) and Strength Training

Response and Effect Variables	DF	Chi-square	*p*-value
Anxiety	10	161.04	<.0001*
MVPA	1	84.14	<.0001*
Race	8	25.34	0.001*
Gender	1	38.42	<.0001*
Anxiety	10	113.29	<.0001*
Strength Training	1	36.47	<.0001*
Race	8	26.50	0.0009*
Gender	1	42.58	<.0001*

Note. MVPA = moderate-to-vigorous physical activity.

*$p < 0.05$.

Resilient Coping

In an identical manner to anxiety, analysis on resilient coping skills was performed, as seen in Table 5 and Table 6. Table 5 displays the prevalence, chi-square values, *p*-values, and prevalence ratios for low resilient coping skills. All four types of PA resulted in a statistically significant *p*-value ($p = <.0001$) and the vigorous activity category showed the highest chi-squared value ($\chi^2 = 146.14$), though MVPA was a close second ($\chi^2 = 144.21$). These large chi-square values indicate a strong probability that PA does indeed yield a significant difference in participants' resilient coping skills.

Table 5

Prevalence of Low Resilience Coping based on Physical Activity

Physical Activity	Low Resilient Coping (%)		Chi-square	*p*-value	Prevalence ratio (95% CI)
	Yes	No			
Moderate					
Sufficient	5.22	21.65	43.75	<.0001*	1.37 (1.24, 1.51)
Insufficient	19.45	53.68			
Vigorous					
Sufficient	12.90	50.72	146.14	<.0001*	1.60 (1.48, 1.72)
Insufficient	11.77	24.61			
MVPA					
Sufficient	14.86	56.02	144.21	<.0001*	1.19 (1.15, 1.23)
Insufficient	9.81	19.31			
Strength Training					
Sufficient	9.64	37.29	64.98	<.0001*	1.11 (1.08, 1.14)
Insufficient	15.03	38.04			

Note. MVPA = moderate-to-vigorous physical activity.

*$p < 0.05$.

Further, the logistic regression models and their corresponding statistically significant *p*-values ($p = <.0001$) in Table 6 reinforce the finding that PA plays a role in resilient coping.

Table 6

Logistic Regression of Low Resilience Coping based on Moderate-to-vigorous Physical Activity (MVPA) and Strength Training

Response and Effect Variables	DF	Chi-Square	*p*-value
Resilience	10	167.09	<.0001*
MVPA	1	144.57	<.0001*
Race	8	23.09	0.003*
Gender	1	4.21	0.04*
Resilience	10	90.78	<.0001*
Strength Training	1	67.56	<.0001*
Race	8	24.89	0.002*
Gender	1	2.53	0.11

Note. MVPA = moderate-to-vigorous physical activity.

*$p < 0.05$.

DISCUSSION

This study explicates the relationship between PA and mental health, specifically anxiety, and resilient coping skills among employees within a higher education institution. Understanding these associations is essential for determining the extent to which PA can function as both a protective and preventive therapeutic against mental health conditions and for exploring avenues of use in the workplace. The results of this project align with those from previous studies, demonstrating the need for continuous research among varied populations and mental health conditions.

Limitations of this study include that the data is from 2022, meaning it may not be reflective of current research trends and could have been residually affected by the COVID-19 pandemic. Furthermore, only individuals associated with the University (employees, spouses, and dependents) were present in the sample, which may limit the generalizability to other populations. Anxiety and resilient coping skills are influenced by multiple sociodemographic and biological factors, making it essential to understand how these findings may translate to individuals unassociated with higher education. Additionally, the definition of PA was limited in this study. PA levels were pre-defined within the survey questionnaire and the MVPA category was calculated using moderate and vigorous PA data. Metabolic equivalents (METs), a common measure of activity levels, were not able to be extrapolated from the available data, limiting the specificity of these results. Further research should be conducted using specific PA quantifications, like METS, to deeper explore the relationship between PA and mental health outcomes of higher education employees.

Conclusions and Recommendations

The analysis of this study produced statistically significant results for the association of various kinds of PA with reduced anxiety and heightened resilient coping skills. Since the results of this study is in alignment with findings of prior studies, it is critical that organizations, specifically health systems and insurers, evaluate the effectiveness and applicability of PA as a therapeutic modality for anxiety. Likewise, PA's ability to bolster resilient coping skills may operate as a protective effect against mental health conditions and should be further considered.

These findings serve as convincing evidence that organizations should assess ways to incorporate PA into their policies and programs for the health and well-being of employees, namely those of higher education institutions. Future research should aim to identify the specific biological and psychological mechanisms that facilitate these mental health responses so that potential therapeutics can be more precisely curated. Additionally, it is important for research to explore the symbiotic relationship between PA and pharmacological therapeutics to maximize treatment efficacy against the rising mental health crisis of our world.

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