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The relationship between physical activity levels and depression, anxiety, and stress among adults

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Abstract

Mental health disorders such as depression, anxiety, and stress represent significant global public health challenges, impacting millions of adults worldwide. Physical activity has been increasingly recognized as a modifiable lifestyle factor with potential benefits for psychological well-being. This study examines the relationship between varying levels of physical activity-sedentary, light, moderate, and vigorous—and the prevalence of depression, anxiety, and stress among adults. Utilizing the Depression, Anxiety, and Stress Scale (DASS-21) alongside physical activity assessments, the research investigates how demographic factors such as gender, residence (rural vs. urban), and family structure influence this relationship. Results indicate that moderate physical activity is most common among males and individuals from joint families, while females and nuclear family residents predominantly engage in light activity. Although no significant gender differences were observed in mental health scores, rural and urban residents showed statistically significant variations in depression and stress levels. The findings underscore the importance of promoting tailored physical activity interventions to improve mental health outcomes, considering demographic and contextual factors. This study contributes valuable insights for developing cost-effective public health strategies aimed at mitigating the growing burden of mental health disorders among adults.

Keywords: Anxiety, depression, mental health, physical activity, psychological well-being, stress

Introduction

Mental health has emerged as one of the most critical public health challenges of the 21st century. According to the World Health Organization (WHO, 2021), depression and anxiety disorders are among the leading causes of disability worldwide, affecting hundreds of millions of people. The increasing prevalence of these psychological conditions across diverse adult populations calls for a deeper understanding of their underlying causes and effective intervention strategies. Alongside clinical treatment options, lifestyle factors-especially physical activity-have gained recognition as crucial determinants of mental health outcomes (Stubbs *et al.*, 2017; Kandola *et al.*, 2019) [28, 15]. In modern societies characterized by rapid urbanization and technological advancements, sedentary lifestyles have become increasingly common. The WHO (2020) reports that approximately one in four adults worldwide do not meet recommended physical activity levels, which negatively impacts both physical and psychological health. Sedentary behavior has been linked with heightened risks of depression, anxiety, and stress, highlighting the importance of promoting active lifestyles as part of holistic health initiatives (Teychenne, Ball, & Salmon, 2010; Hallgren *et al.*, 2020) [30, 12]. Physical activity encompasses a broad spectrum of bodily movements varying in intensity-from sedentary to light, moderate, and vigorous. Each level of activity may exert differential effects on mental health. While moderate-to-vigorous physical activity (MVPA) consistently shows protective effects against symptoms of depression and anxiety, emerging research suggests that even light physical activity may confer psychological benefits compared to sedentary behavior (Paluska & Schwenk, 2000; Rebar *et al.*, 2015) [24, 26]. Despite this understanding, a significant portion of adults remains insufficiently active, raising concerns about the escalating burden of mental health issues globally (Bauman *et al.*, 2012) [3].

The Depression, Anxiety, and Stress Scale (DASS), developed by Lovibond and Lovibond (1995) [20], is a widely validated tool used to assess these emotional states across clinical and non-clinical populations. It provides a nuanced measure of psychological distress, allowing researchers to capture the severity and co-occurrence of depression, anxiety, and stress symptoms. Employing the DASS alongside physical activity assessments offers an effective approach to elucidate the relationship between

lifestyle behaviors and mental health outcomes (Antony *et al.*, 1998; Henry & Crawford, 2005) [2, 13]. Despite considerable evidence supporting the mental health benefits of physical activity, many studies have focused either on general populations or clinical groups without adequately differentiating the effects of various activity intensities or accounting for demographic influences. More context-specific research is required since variables including age, gender, socioeconomic situation, and educational background can affect the association between physical activity and psychological well-being. (McDowell *et al.*, 2019) [22]. Therefore, exploring these dynamics in adult populations, with attention to demographic variables, is critical for tailoring public health interventions and policy initiatives. Globally, mental health disorders constitute a substantial portion of the total disease burden. Depression affects over 280 million people, while anxiety disorders affect more than 260 million individuals worldwide (WHO, 2021). These conditions are linked to reduced quality of life, diminished productivity, increased healthcare costs, and elevated risk of comorbid physical illnesses (Friedrich, 2017; Kessler *et al.*, 2005) [11, 16]. Stress, although not a clinical diagnosis, is recognized as a pervasive factor contributing to the onset and exacerbation of mental health disorders (Lazarus & Folkman, 1984) [18]. Adults today face multiple stressors, including occupational pressures, financial instability, social isolation, and health concerns. The COVID-19 pandemic has further intensified mental health problems, with rising reports of depression, anxiety, and stress symptoms worldwide (Vindegaard & Benros, 2020) [33]. Preventive approaches that enhance resilience and psychological health are therefore urgently needed.

The WHO defines physical activity as any skeletal muscle-driven movement of the body that requires the use of energy (WHO, 2010). It is well-established that physical activity benefits cardiovascular health, metabolic function, and overall longevity. Importantly, a growing body of evidence also links physical activity with improved mental health outcomes (Mammen & Faulkner, 2013; Pedersen & Saltin, 2015) [21, 25]. The production of endorphins, serotonin, & dopamine-neurotransmitters linked to moods regulation-are examples of physiological systems (Dishman *et al.*, 2006) [9]. Psychologically, physical activity enhances self-efficacy, distracts from negative thoughts, and fosters social interaction, all contributing to better mental health (Biddle & Asare, 2011) [4]. Studies demonstrate that adults engaging in regular moderate to vigorous physical activity report fewer symptoms of depression and anxiety (Tuohy *et al.*, 2013) [31], However, the mental health benefits of light physical activity are less consistently documented, though some research suggests positive effects.

Physical activity intensity is classified as sedentary (minimal energy expenditure), light (e.g., slow walking), moderate (e.g., brisk walking), and vigorous (e.g., running). Moderate and vigorous activities show the strongest associations with reduced depression and anxiety symptoms (Rebar *et al.*, 2015) [26], whereas sedentary lifestyles correlate with greater psychological distress (Teychenne *et al.*, 2010) [30]. while sedentary behavior is linked with increased psychological distress (Hallgren *et al.*, 2020) [12]. Yet, many adults struggle to meet recommended guidelines of 150 minutes of moderate or 75 minutes of vigorous activity per week (WHO, 2020). Understanding how different activity levels relate to mental health can guide more inclusive, tailored interventions. The DASS-21, a shortened form of the original DASS, comprises 21 items assessing depression, anxiety, and stress (Lovibond & Lovibond, 1995) [20]. Validated across diverse populations (Antony *et al.*, 1998; Henry & Crawford, 2005) [2, 13], it provides a comprehensive mental health profile suitable for correlational studies with physical activity. Demographic factors such as age, gender, socioeconomic status, education, and employment influence both physical activity and mental health outcomes (McDowell *et al.*, 2019) [22]. Women generally report higher depression and anxiety rates but may engage less in vigorous activities compared to men (Nolen-Hoeksema, 2001) [23].

Accounting for these variables improves the relevance and accuracy of findings. Recent evidence also underscores the role of environmental and psychosocial determinants in shaping physical activity and mental health. Neighbourhood safety, availability of green spaces, and social support networks have been linked to increased physical activity engagement and improved psychological well-being (Sallis *et al.*, 2016; Sturm & Cohen, 2014) [27, 29]. These contextual factors highlight the complexity of lifestyle behaviors and the need for multifaceted interventions. Furthermore, emerging research has begun to explore the role of technology-based physical activity interventions, such as mobile health applications and online exercise programs, particularly relevant in the context of pandemic-related restrictions (Feter *et al.*, 2020) [10]. For instance, older adults may face physical barriers reducing activity levels, while socioeconomic status affects access to recreational facilities (Liao *et al.*, 2020) [19]. These digital platforms offer promising avenues for increasing physical activity adherence and mitigating mental health symptoms remotely, though disparities in access and digital literacy remain challenges. This study addresses existing gaps by examining the relationship between varying physical activity levels-sedentary, light, moderate, and vigorous-and depression, anxiety, and stress among adults, while considering demographic influences. The findings aim to support evidence-based promotion of physical activity as a cost-effective, accessible strategy to improve mental health and inform public health policy and program development.

Rationale of the Study

In today's fast-paced and increasingly sedentary society, mental health issues such as depression, anxiety, and stress have become prevalent among adults across diverse age groups and backgrounds. Numerous studies suggest that lifestyle factors, particularly physical activity, play a crucial role in influencing psychological well-being. Despite this, a large segment of the adult population continues to engage in low levels of physical activity, potentially contributing to poor mental health outcomes. Understanding the relationship between physical activity and mental health is essential for developing effective, non-pharmacological strategies to combat psychological distress. The Depression, Anxiety, and Stress Scale (DASS) provides a standardized and reliable tool to assess these emotional states, allowing for accurate analysis of their association with physical activity levels.

This study aims to fill gaps in existing literature by specifically examining how varying levels of physical activity correlate with depression, anxiety, and stress among adults. It also considers the influence of demographic variables, offering a more comprehensive understanding of mental health trends within the adult population. The findings can contribute to the design of targeted interventions, public health policies, and awareness programs that promote physical activity as a means to enhance mental well-being.

Objectives

- To assess the demographic characteristics of adult respondents.
- To measure the physical activity levels of adults and categorize them into low, moderate, and high activity groups.
- To examine the relationship between physical activity levels and scores of depression, anxiety, and stress among adults.

Review of Literature

Mental health disorders, particularly depression, anxiety, and stress, represent a significant global public health challenge in the 21st century (WHO, 2021). According to the World Health Organization, these conditions are among the leading causes of disability worldwide, affecting hundreds of millions and contributing substantially to the global disease burden (Friedrich, 2017; Kessler *et al.*, 2005) [11, 16]. In recent decades, research has increasingly focused on lifestyle factors such as physical activity as potential modifiable determinants of mental health outcomes (Stubbs *et al.*, 2017; Kandola *et al.*, 2019) [28, 15]. Physical activity (PA) has long been recognized for its physiological benefits, including improved cardiovascular health and metabolic function (WHO, 2010; Pedersen & Saltin, 2015) [25]. More recently, its positive impact on psychological well-being has gained empirical support. The protective role of moderate-to-vigorous physical activity (MVPA) against depression and anxiety symptoms is well documented (Cooney *et al.*, 2013; Rebar *et al.*, 2015) [7, 26]. The underlying mechanisms are multifaceted, involving neurochemical changes such as the release of endorphins and neurotransmitters like serotonin and dopamine, which regulate mood (Dishman *et al.*, 2006) [9]. Additionally, physical activity promotes psychological benefits by enhancing self-efficacy, distracting from negative thoughts, and fostering social interaction (Biddle & Asare, 2011) [4]. However, the relationship between light physical activity and mental health is less consistent. Some studies suggest even light-intensity activity, such as slow walking, can confer psychological benefits when compared to sedentary behavior (Paluska & Schwenk, 2000) [24]. Sedentary lifestyles, characterized by minimal energy expenditure, have been linked to increased risk of depression, anxiety, and stress (Teychenne, Ball, & Salmon, 2010; Hallgren *et al.*, 2020) [30, 12]. Despite public health guidelines recommending at least 150 minutes of moderate or 75 minutes of vigorous physical activity per week (WHO, 2020), a significant portion of the adult population remains inactive (Bauman *et al.*, 2012) [3]. The Depression, Anxiety, and Stress Scale (DASS) developed by Lovibond and Lovibond (1995) [20] is widely used for assessing psychological distress. Its validity across clinical and non-clinical populations makes it a preferred tool for research correlating mental health outcomes with lifestyle variables (Antony *et al.*, 1998; Henry & Crawford, 2005) [2, 13]. The DASS-21, a shortened form, allows for efficient evaluation of depression, anxiety, and stress, which frequently co-occur and exacerbate one another (Lovibond & Lovibond, 1995) [20]. Research highlights the importance of demographic factors in moderating the physical activity-mental health relationship. Age, gender, socioeconomic status, education, and employment can all influence activity levels and psychological well-being (McDowell *et al.*, 2019) [22]. For example, older adults often experience physical limitations that reduce activity, while socioeconomic barriers limit access to recreational opportunities (Liao *et al.*, 2020) [19]. Women tend to report higher rates of depression and anxiety but participate less in vigorous activities compared to men (Nolen-Hoeksema, 2001) [23]. The role of family structure is also notable. Studies indicate that joint family systems may provide stronger social support, mitigating mental health problems relative to nuclear families, where individuals might experience greater isolation (Kumar, 2016) [17]. Contextual influences such as neighborhood safety, availability of green spaces, and social support networks have been shown to impact physical activity engagement and mental health (Sallis *et al.*, 2016; Sturm & Cohen, 2014) [27, 29]. These findings underscore the complexity of lifestyle behaviors and the necessity for multidimensional intervention approaches.

The rise of technology-based physical activity interventions, including mobile health apps and online exercise programs, has also been documented as promising, especially during the COVID-19 pandemic, though access and digital literacy disparities pose challenges (Feter *et al.*, 2020) [10]. While extensive research has explored physical activity's benefits for mental health, many studies have either focused on general populations or clinical groups without thoroughly differentiating the effects of various activity intensities or accounting for demographic variables (Stubbs *et al.*, 2017; McDowell *et al.*, 2019) [28, 22]. Moreover, inconsistent findings about light physical activity and its psychological benefits warrant further examination. There is also limited research examining these relationships in specific adult populations with consideration for rural-urban residence and family type, factors which may influence both physical activity engagement and mental health outcomes.

2. Material and methods

2.1 Selection of subject

For this study, sample was chosen from Lucknow City. Convenience random sampling procedures were used in the selection of respondents. The entire Lucknow is divided into urban and rural Lucknow. Using random sampling techniques, 331 college-going students were selected, of which 165 were male and 166 were female.

2.2. Tools

Tools were utilized, including the DASS-21 by developed by Sydney Lovibond and Peter Lovibond in 1995 [20], and a self-made socio-demographic questionnaire for determining the respondents' demographic profile.

2.3 Data Collection

With Respondent consent, data was collected personally through the questionnaire method, along with observations that Include the degree of physical activity linked with their psychlogical distress. A correlational research design was used for the study. Age, gender, and place of residence (rural vs. urban) are taken as independent variables, and cognition and interpersonal intelligence are taken as dependent variables.

2.4 Statistical Analysis

IBM SPSS Statistics version 20 was utilised for the statistical analysis. With the use of the t-test for test significance, frequency %, mean, standard deviation, and correlation coefficient, utilizing Pearson's correlation, Physical activity's impact on psychological distress and the relation between them are assessed.

3. Result and discussion

Table 3.1: Socio-demographic Profile of the Respondents

S. No.	Category	Frequency (%)
Gender	Male	150(50.0%)
	Female	150(50.0%)
Area	Rural	168(56.0%)
	Urban	132(44.0%)
Family type	Nuclear	232(77.3%)
	Joint	68(22.7%)

The above table shows that out of 300 respondents, 150 (50.0%) were males and 150 (50.0%) were females. Regarding the area of residence, 168 (56.0%) belonged to rural areas, while 132 (44.0%) belonged to urban areas. In terms of family type, 68 respondents (22.7%) belonged to joint families, and 232 respondents (77.3%) belonged to nuclear families.

Table 3.2: Distribution of Physical activity levels on the basis of demographic variables.

		Sedentary physical activity	Light physical activity	Moderate physical activity	Vigorous physical activity
		Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Gender	Male	13(8.7%)	52(34.7%)	73(48.7%)	12(8.0%)
	Female	23(15.3%)	87(58.0%)	37(24.7%)	3(2.0%)
Area	Rural	21(12.5%)	78(46.4%)	63(37.5%)	6(3.6%)
	Urban	15(11.4%)	61(46.2%)	47(35.6%)	9(6.8%)
Family type	Nuclear	27(11.6%)	120(51.7%)	74(31.9%)	11(4.7%)
	Joint	9(13.2%)	19(27.9%)	36(52.9%)	4(5.9%)

Table 3.2 shows the distribution of physical activity levels by gender, residence, and family type**.** Among male respondents, the majority (48.7%) engage in moderate physical activity, followed by 34.7% who participate in light activity, 8.0% who perform vigorous activity, and the smallest proportion (8.7%) adopt a sedentary lifestyle. In contrast, female respondents most commonly participate in light activity (58.0%), with 24.7% involved in moderate activity, 15.3% leading a sedentary lifestyle, and only 2.0% engaging in vigorous activity.

Looking at rural residents, the highest proportions are seen in light activity (46.4%) and moderate activity (37.5%), with fewer people choosing a sedentary lifestyle (12.5%) or vigorous activity (3.6%). Urban residents display a similar pattern, with 46.2% engaging in light activity, 35.6% in moderate activity, 11.4% adopting a sedentary lifestyle, and 6.8% involved in vigorous activity.

Regarding family type, those living in nuclear families predominantly prefer light activity (51.7%), followed by moderate activity (31.9%), with 11.6% sedentary and 4.7% engaging in vigorous activity. In joint families, the majority participate in moderate activity (52.9%), with 27.9% opting for light activity, 13.2% adopting a sedentary lifestyle, and 5.9% involved in vigorous activity.

Table 3.3: t-test (Distribution of gender on the basis of psychological disorder)

	Gender	Mean	Std. Deviation	t	P
Depression	Male	8.0933	4.61301	.928	.706
	Female	7.6000	4.59793		
Anxiety	Male	7.8133	4.52493	.627	.097
	Female	7.5000	4.11700		
Stress	Male	7.3133	4.15495	-.711	.819
	Female	7.6600	4.28644		

Table 3.3 presents the comparison of Depression, Anxiety, and Stress scores between male and female respondents. The t-values for Depression (.928), Anxiety (.627), and Stress (-.711) indicate no statistically significant differences between the two groups, as supported by the p-values of .706, .097, and .819 respectively, all exceeding the 0.05 significance level.

Table 3.3 shows that male respondents have slightly higher mean scores for Depression (μ = 8.0933) and Anxiety (μ = 7.8133) compared to female respondents, whose mean scores are Depression (μ = 7.6000) and Anxiety (μ = 7.5000). However, female respondents have a marginally higher mean score for Stress (μ = 7.6600) compared to males (μ = 7.3133). Despite these differences in means, the statistical analysis indicates that gender does not have a significant impact on levels of Depression, Anxiety, or Stress among the respondents.

Table 3.4: t-test (Distribution of living area on the basis of psychological disorder)

	Area	Mean	Std. Deviation	T	P
Depression	Rural	7.7024	4.21369	-.612	.020
	Urban	8.0303	5.06890		
Anxiety	Rural	7.9821	4.09684	1.475	.227
	Urban	7.2424	4.57361		
Stress	Rural	7.4940	3.85671	.034	.043
	Urban	7.4773	4.65196		

Table 3.4 shows the comparison of Depression, Anxiety, and Stress scores between rural and urban respondents. The t-values for Depression (-.612) and Stress (.034) indicate non-significant differences between the two groups at the 0.05 level, while the p-values are .020 and .043 respectively. However, the p-values suggest a need for careful consideration. For Anxiety, the t-value is 1.475 with a p-value of .227, indicating no significant difference.

Table also demonstrates that urban respondents have a slightly higher mean score for Depression (μ = 8.0303) compared to rural respondents (μ = 7.7024), while rural respondents have higher mean scores for Anxiety (μ = 7.9821) and Stress (μ = 7.4940) compared to urban respondents (Anxiety μ = 7.2424, Stress μ = 7.4773). Despite these differences in means, the results suggest that there is no statistically significant difference in Anxiety between rural and urban respondents. The significance values for Depression (.020) and Stress (.043), being less than 0.05, indicate that the differences observed in these domains may be statistically significant and warrant further investigation.

Table 3.5: t-test (psychological disorder on the basis of family types)

	Family type	Mean	Std. Deviation	T	P
Depression	Nuclear	8.0086	4.37228	1.126	.015
	Joint	7.2941	5.31980		
Anxiety	Nuclear	7.7543	4.16697	.722	.096
	Joint	7.3235	4.82976		
Stress	Nuclear	7.6034	4.07692	.886	.086
	Joint	7.0882	4.67683		

Table 3.5 compares the mean scores of Depression, Anxiety, and Stress between respondents from Nuclear and Joint family types. The t-values for Depression (1.126), Anxiety (0.722), and Stress (0.886) indicate varying levels of differences between the groups. The associated p-values are .015 for Depression, .096 for Anxiety, and .086 for Stress.

Table 3.5 reveals that respondents from Nuclear families have higher mean scores on Depression (μ = 8.0086), Anxiety (μ = 7.7543), and Stress (μ = 7.6034) compared to those from Joint families, who have mean scores of Depression (μ = 7.2941), Anxiety (μ = 7.3235), and Stress (μ = 7.0882). Among these, only the difference in Depression scores is statistically significant (p = .015), indicating that individuals from Nuclear families experience significantly higher levels of depression than those from Joint families. The differences in Anxiety and Stress scores, although higher for Nuclear family respondents, are not statistically significant (p>0.05), suggesting no meaningful differences between family types in these domains.

Table 3.6: Anova test (Comparison of psychological disorder on the basis of level of Physical activity)

	Sedentary physical activity	Light physical activity	Moderate physical activity	Vigorous physical activity	F	Sig
Depression	7.6111±4.51839	7.9065±4.09647	7.6818±5.13476	9.0667±5.39135	.435	.728
Anxiety	7.5833±4.33837	7.8993±3.99328	7.6091±4.71791	5.9333±4.18273	.949	.417
Stress	7.6111±3.81933	7.8417±3.87721	7.0818±4.71214	6.8667±4.40562	.783	.504

Table 3.6 shows the mean scores for depression across different levels of physical activity are as follows: sedentary individuals reported a mean score of 7.61±4.52, those engaging in light activity reported 7.91±4.10, individuals with moderate activity had a mean score of 7.68±5.13, and those involved in vigorous activity reported a slightly higher mean score of 9.07±5.39. However, the results of the One-Way ANOVA revealed no statistically significant difference in depression scores among the four physical activity categories, as indicated by an F-value of 0.435 and a p-value of 0.728 (p>0.05). This suggests that although respondents with vigorous physical activity showed slightly elevated depression scores, the variation is not statistically meaningful.

Table 3.8: Correlation between Physical activity and domains of psychological disorder.

	physical activity level	Depression	Anxiety	Stress
Physical activity level	1			
Depression	.026	1		
Anxiety	-.056	.711**	1	
Stress	-.071	.747**	.784**	1
**. Correlation is significant at the 0.01 level (2-tailed).				

Table 3.8 shows the correlation analysis revealed that physical activity level had a very weak positive correlation with depression (r = .026), a very weak negative correlation with anxiety (r = -0.056), and a weak negative correlation with stress (r = -0.071); however, none of these correlations were statistically significant. This suggests that while there may be a slight tendency for increased physical activity to be associated with lower levels of depression, anxiety, and stress, these relationships are not strong enough to draw definitive conclusions. In contrast, depression showed a strong and statistically significant positive correlation with both anxiety (r = .711, $p<.01$) and stress (r = .747, $p<.01$), indicating that individuals experiencing higher levels of depression are also likely to report elevated anxiety and stress levels. Furthermore, anxiety was found to have a very strong and statistically significant positive correlation with stress (r = .784, $p<.01$), highlighting the close association between these two emotional states. Overall, while physical activity appears to have a minimal and non-significant inverse relationship with mental health issues, the significant intercorrelations among depression, anxiety, and stress suggest that these conditions frequently co-occur and are closely linked.

Discussion

The findings of this study provide valuable insights into the complex relationship between physical activity levels and psychological well-being, particularly depression, anxiety, and stress among adults. Despite the common assumption that physical activity is protective against mental health issues (Mammen & Faulkner, 2013; Rebar *et al.*, 2015) [21, 26], our results suggest that the associations between physical activity and mental health are weak and not statistically significant in this population. There were no statistically significant differences in depression, anxiety, or stress scores between males and females. These findings align with previous research indicating that gender may not significantly impact mental health outcomes when other variables are controlled (Nolen-Hoeksema, 2012; Van de Velde *et al.*, 2010) [23, 32]. Regarding the area of residence, rural and urban respondents displayed similar physical activity patterns, but subtle variations in mental health were noted. Urban residents showed slightly higher depression scores, whereas rural residents reported higher anxiety and stress levels. Although anxiety did not significantly differ by residence the differences in depression and stress approached statistical significance), warranting further investigation. These findings are consistent with previous studies suggesting that rural residents may face unique stressors related to limited mental health resources, while urban residents may be more susceptible to depression due to lifestyle stressors and isolation .Family type also emerged as a relevant factor. Participants from nuclear families reported significantly higher levels of depression compared to those from joint families. Although anxiety and stress scores were higher in nuclear family respondents, these differences were not statistically significant. This observation supports earlier findings suggesting that joint family systems may provide better emotional support and serve as a buffer against mental health issues .When examining the relationship between physical activity and mental health, our results indicate that activity level did not significantly affect depression scores, as revealed by One-Way ANOVA. While those reporting vigorous activity had slightly elevated depression scores, this was not statistically meaningful. These results contradict several studies that have reported a protective effect of vigorous or moderate physical activity on depression and other mental health issues (Craft & Perna, 2004; Cooney *et al.*, 2013) [8, 7]. One plausible explanation may be the bidirectional nature of the relationship between mental health and physical activity, where individuals with mental health concerns may struggle to maintain consistent physical activity routines (Stanton *et al.*, 2020). Correlation analysis further demonstrated that physical activity was only very weakly associated with depression, anxiety, and stress, and none of these correlations were statistically significant. These findings imply that in this sample, physical activity alone may not be a strong determinant of psychological well-being. It is possible that other psychosocial factors-such as social support, personality traits, or coping mechanisms-may mediate the relationship between physical activity and mental health (Holt-Lunstad *et al.*, 2010) [14]. A notable finding from this study is the significant and strong positive correlation among depression, anxiety, and stress scores (depression-anxiety, depression-stress, anxiety-stress. These findings echo previous research suggesting that these psychological constructs are highly interrelated and often co-occur (Lovibond & Lovibond, 1995; Kessler *et al.*, 2005) [20, 16]. The strong interdependence among these conditions highlights the need for integrated assessment and intervention strategies in mental health services, rather than treating each symptom in isolation. While the lack of significant association between physical activity and mental health indicators might seem counterintuitive, it underlines the importance of considering contextual and demographic factors when evaluating such relationships. Cultural attitudes, economic stress, family dynamics, and accessibility of recreational spaces may all influence both physical activity levels and mental health outcomes in complex ways.

Future research should adopt a longitudinal design to better capture causal relationships and explore potential mediators such as self-efficacy, sleep quality, and social support. Additionally, incorporating qualitative components could provide deeper insights into personal experiences related to mental health and physical activity.

Conclusion

The study aimed to explore the relationship between physical activity levels and the prevalence of depression, anxiety, and stress among adults. Based on data collected from 300 respondents, equally divided by gender and varied by residence and family type, several key findings emerged. Males were more likely to engage in moderate physical activity, while females predominantly participated in light activity. Both rural and urban residents tended toward light and moderate activity, with very few individuals engaging in vigorous exercise. Similarly, individuals from nuclear families mostly preferred light activity, whereas those from joint families were more inclined toward moderate activity.

Regarding mental health outcomes, although males showed slightly higher mean scores in depression and anxiety and females showed marginally higher stress levels, none of

these gender-based differences were statistically significant, suggesting that gender does not have a meaningful impact on depression, anxiety, or stress among adults. In terms of residence, urban respondents exhibited slightly higher depression scores, whereas rural participants reported higher levels of anxiety and stress. While the differences in anxiety were not statistically significant, depression and stress scores showed significance with p-values of .020 and .043 respectively, indicating that the area of residence may influence certain mental health outcomes. With respect to family type, adults from nuclear families had significantly higher depression scores than those from joint families ($p = .015$), while the differences in anxiety and stress, though slightly higher among nuclear family members, were not statistically significant.

When analyzing the relationship between physical activity and depression, it was observed that depression levels varied slightly across activity categories, with the highest mean seen in individuals engaging in vigorous activity. However, this variation was not statistically significant, suggesting that physical activity level alone does not account for differences in depression. Further correlation analysis revealed minimal and statistically insignificant relationships between physical activity and depression, anxiety, or stress. On the other hand, there were strong and statistically significant positive correlations among depression, anxiety, and stress themselves, indicating that these emotional states often co-occur and are closely interconnected.

In conclusion, while some demographic variables such as residence and family type were significantly associated with depression and stress, physical activity levels did not show a strong or statistically meaningful relationship with mental health outcomes. This challenges commonly held assumptions that higher levels of physical activity directly contribute to reduced psychological distress in all contexts. It suggests that while physical activity remains a valuable component of a healthy lifestyle, its impact on mental well-being may be moderated by other factors such as environmental stressors, social support systems, cultural norms, and individual psychological resilience.

The findings underscore the need for a more holistic and multidimensional approach to mental health promotion, incorporating not only behavioral strategies like exercise but also psychosocial interventions aimed at fostering emotional regulation, community support, and adaptive coping mechanisms. Moreover, the significant interrelation among depression, anxiety, and stress points to the importance of integrated mental health assessments and interventions that address the broader emotional spectrum rather than isolated symptoms. Future research could benefit from longitudinal designs to explore causal pathways and from including qualitative data to capture the lived experiences and contextual influences shaping adult mental health.

Limitations of the Study

1. **Cross-Sectional Design**: The study employed a cross-sectional design, which captures data at a single point in time. Longitudinal studies would be more effective in identifying cause-and-effect dynamics.
2. **Limited Generalizability**: The sample consisted of 300 respondents, which may not fully represent the larger adult population across diverse geographic, cultural, and socioeconomic backgrounds. Hence, the findings may not be generalizable to broader populations.
3. **Lack of Control for Confounding Variables**: Several potential confounding factors—such as diet, sleep quality, chronic illness, substance use, personality traits, and life events—were not controlled for, which could have influenced the mental health outcomes independently of physical activity levels.
4. **No Consideration of Gender-Specific or Age-Specific Responses**: While the study considered gender as a demographic factor, it did not explore how gender identity, roles, or age groups might uniquely influence the experience or expression of physical activity and mental health.

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