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# Effect of regular physical activities and daytime nap intervention on enhancing mental health and self-esteem in healthy participants

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## Abstract:

**BACKGROUND:** Regular physical activity and proper rest play a significant role in the quality of life of every individual. The purpose of this study was to investigate the effect of physical activities and daytime naps on mental health and self-esteem.

**MATERIALS AND METHODS:** A pretest and posttest study design was selected with 95 participants who were randomly assigned to two groups. Forty-five participants were part of the interventional group, whereas 50 participants were assigned to the control group. The interventional group participated in physical activities and took a short nap of less than 20 min per day three times a week for 12 weeks. Meanwhile, control group participants were free to do daily activities without participating in any sports activity. Participants' mental health and self-esteem were measured before and after 12 weeks. Data were compared using the Wilcoxon signed-rank test and Mann-Whitney *U* test.

**RESULT:** The results showed no significant difference between pre-and post-test in mental health ( $P = 0.072$ ) and self-esteem ( $P = 0.061$ ) for the control group, whereas the interventional group showed a significant difference between pre-and post-test for mental health ( $P \leq 0.001$ ) and self-esteem ( $P \leq 0.001$ ), and mean scores for mental health ( $59.16 \pm 10.43$ ) and self-esteem ( $25.62 \pm 3.35$ ) were higher than pretest ( $55.00 \pm 11.68$ ) ( $22.93 \pm 1.80$ ) scores. Mental health and self-esteem improved in the interventional group when compared with the control group after 12 weeks.

**CONCLUSION:** The findings revealed that the interventional group had significantly higher mental health and self-esteem than the control group. Physical activities may improve mental health, self-esteem, and overall wellness. To obtain these benefits and preserve a quality of life, daily physical exercises and mandatory rest are necessary. Therefore, policymakers should prioritize these interventions to promote the overall health of such populations.

## Keywords:

Exercise, mental health, self-concept, sleep, sleepiness

## Introduction

Physical inactivity is the fourth largest worldwide cause of death. It is also associated with the risk of all-cause mortality, cardiovascular disease, stroke, hypertension, and diabetes. Regular physical exercises help to prevent and manage many

chronic diseases. Regular exercise benefits can not only improve overall health and appearance but also improve mental health and emotional well-being, increasing life expectancy.

Physical health has traditionally received more attention; however, the benefits of exercise on mental health should not be

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overlooked. Depression, anxiety, and stress are just some of the mental health issues that can benefit from a regular exercise routine. In addition to these benefits, it can also elevate one's disposition, boost confidence, and decrease the possibility of future mental health issues. The World Health Organization (WHO) has defined positive mental health as "a state of emotional and psychological well-being in which an individual realizes his or her potential, adapts to the normal stresses of life, engages in productive and satisfying work, and meets the demands of daily life."<sup>[1]</sup> McMahon *et al.*<sup>[2]</sup> revealed that there is a positive correlation between engaging in physical activity more frequently and experiencing higher levels of well-being, as well as lower levels of anxiety and depressive symptoms. These findings indicate that promoting physical activity could be an effective approach to enhancing mental health. Mental health benefits have been beneficial for individuals who meet moderate physical activity levels. Physical activity of low intensity such as activities of daily living decreases sedentary time and improves mental health outcomes as well.<sup>[3]</sup> The positive effects of physical activity on mental health appear to be associated with the improved ability of stress management or the capacity to defend stressful situations, and enhanced life-satisfaction.<sup>[4]</sup>

In addition to enhancing mental health, physical activity can boost self-esteem. As individuals engage in physical activities and perceive changes in physical fitness and appearance, self-confidence and sense of self-worth might increase, which can lead to an increase in self-esteem.<sup>[5]</sup> Participation in physical activity increases blood flow to the brain, which enhances alertness and oxytocin levels; as a result, self-esteem improves.<sup>[6]</sup> There is a significant relationship between physical activity and increased self-esteem because people who engage in certain types of exercise have the opportunity to increase or even build their self-esteem through their physical activity, whereas those who are not physically active have no such opportunity.<sup>[7]</sup> Self-esteem has a direct association with mental health. Poor self-esteem contributes to feelings of despair and anxiety, as well as to making poor decisions. Individuals with high self-esteem are typically happier and have a higher quality of mental health level.<sup>[6]</sup> Regular physical activity can enhance self-esteem and relieve stress and anxiety. Physical activity can assist in the prevention of mental health issues and enhance the quality of life.<sup>[8]</sup>

Many researches have established the relationship between physical activity, mental health, and self-esteem; more data indicate that physical activity can have positive benefits on the mental health status and self-esteem level. There is growing compelling psychological and physiological evidence that sleep and mental health are closely associated and may have a mutually reinforcing effect.<sup>[9]</sup> Current evidence suggests that sleep

disturbance may contribute to the development of several mental health conditions. A China population-based epidemiological investigation revealed that short nap duration protects against depressive symptoms.<sup>[10]</sup> Napping during the day can help individuals recuperate from fatigue and depression and enhance their mental health. Therefore, daytime napping may also be associated with physical activity, as fatigue, depression, and mental health are correlated with physical activity.<sup>[11]</sup> According to some research, a shorter napping length is beneficial for physical activity, whereas others argue for longer napping periods.<sup>[12]</sup> The association between daytime napping and physical activity in healthy individuals has been the subject of research.

This conceptual figure visually represents the proposed theoretical framework of the study. It shows the two main interventions, regular physical activities, and daytime naps, and how they are expected to lead to enhanced mental health and improved self-esteem in healthy participants.

Maintaining good mental health is crucial for overall well-being; yet, many individuals struggle with issues such as stress, low mood, and poor self-esteem. Although the benefits of regular exercise on physical health are well-established, its impact on mental health and self-esteem remains an area requiring further exploration. Similarly, the role of daytime napping, a common practice with potential restorative effects, warrants investigation in the context of enhancing mental wellness. This study aims to examine the combined influence of regular physical activity and a consistent daytime napping routine on improving mental health and self-esteem in a population of healthy adult participants. The researchers hypothesized that the intervention involving both physical activity and daytime napping may result in the most significant enhancements in mental health and self-esteem, in comparison to the programs focusing just on one aspect or the control group. The combined impact of these two lifestyle characteristics is anticipated to improve the overall mental health and self-perception of the general adult population.

This study will provide valuable insights into the interplay between physical activity, daytime napping, and mental health outcomes. The findings could inform the development of holistic, evidence-based strategies to promote mental wellness and self-esteem, ultimately contributing to the overall quality of life and resilience of healthy individuals.

## Materials and Methods

**Study Design and Setting:** A case-control and pre-test post-test study design was selected to meet the study objectives. This study was conducted in the Fiji National

University, Lautoka Campus, Fiji, during the academic session 2023–2024.

**Study Participants and Sampling:** Ninety-five individuals participated in this study voluntarily. Participants were randomly recruited into two groups. Group (A) consisted of 45 participants; they all were part of the interventional group. Group (B) consisted of 50 participants as the control group.

**Inclusion criteria:** Healthy participants aged between 19 and 25 years, participants who never participated in any type of sports competition at any level, had no musculoskeletal disorder or sustained any injury 3 months before the study, and were deemed suitable for physical activity.

**Exclusion criteria:** Exclusion criteria included participants on medication, chronic or acute pathologies, having a physical or mental condition that limited motor, sensory, or cognitive abilities; having contraindications for physical activity; being medically diagnosed as having a primary sleep disorder (such as sleep apnea or primary insomnia); or having a history of sleep disorders.

### Outcome measures

**Mental Health:** Mental health is a condition of mental well-being that helps individuals cope with the stresses of life, realize their abilities, learn and work well, and contribute to their community (WHO).<sup>[1]</sup>

**Self-Esteem:** Self-esteem is related to a person's ability to hold a favorable attitude toward oneself.<sup>[13]</sup>

**Daytime sleep:** Daytime naps are usually brief periods of sleep lasting from a few minutes to a few hours. Such naps may vary in frequency from the occasional nap to planned periods of rest up to several times each day in habitual nappers.<sup>[14]</sup>

### Data collection tool and technique

#### Tools

**Mental Health Inventory (MHI):** The MHI was created as part of the Rand National Health Insurance Study by Veit and Ware in 1983. MHI is a self-reported questionnaire and is simple to administer. It gives a rapid evaluation of both positive and negative mental health aspects. MHI has been extensively used to investigate a wide range of populations. This tool measures numerous aspects of mental health, such as anxiety, depression, behavioral control, positive affect, and general distress. Cronbach's alpha for the MHI is 0.82. The MHI has been widely researched in broad populations and is supported by substantial evidence of its validity. During field testing for MHI, it demonstrated high levels of convergent and discriminant validity.<sup>[15,16]</sup> The whole MHI contains 18 items and has four subscales (anxiety,

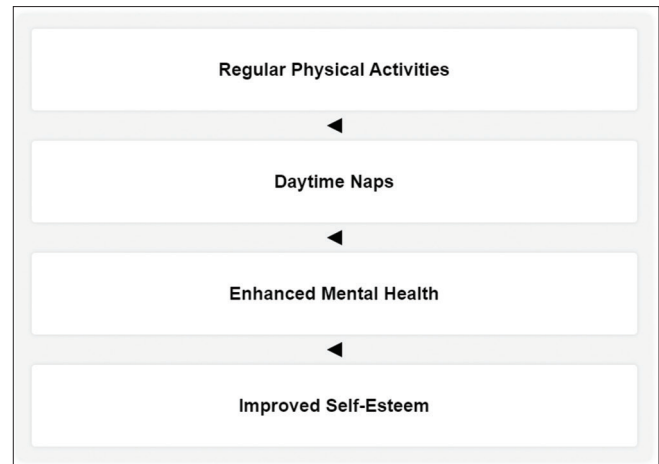


Figure 1: Theoretical framework in a conceptual figure

depression, behavioral control, positive affect) and one total score. The subscale and total scores range from 0 to 100. Higher scores indicate better mental health.

**Rosenberg Self-Esteem Scale:** The Rosenberg self-esteem scale is a self-reported instrument that is widely used to evaluate the self-esteem of an individual. This is a 10-item scale that measures global self-worth by measuring both positive and negative feelings about the self. All items are answered using a 4-point Likert scale, ranging from strongly agree to strongly disagree. There are reverse scores for five items. Higher scores indicate higher self-esteem.<sup>[13]</sup>

### Intervention

#### Regular physical activities

Participants were required to engage in moderate-to-vigorous physical activities for a minimum of 150 min per week.

The physical activities included a combination of aerobic exercises (e.g., brisk walking, jogging, cycling) and strength training exercises (e.g., bodyweight exercises, resistance training).

Participants were provided with detailed exercise guidelines, demonstrations, and access to supervised group exercise sessions three times per week.

#### Daytime naps

Participants were instructed to take a 20-min nap during the day, preferably in the early afternoon.

Participants were encouraged to maintain a consistent nap schedule and were provided with sleep hygiene education to optimize the napping experience.

The intervention was implemented over 12 weeks, with participants in the intervention group engaging in the

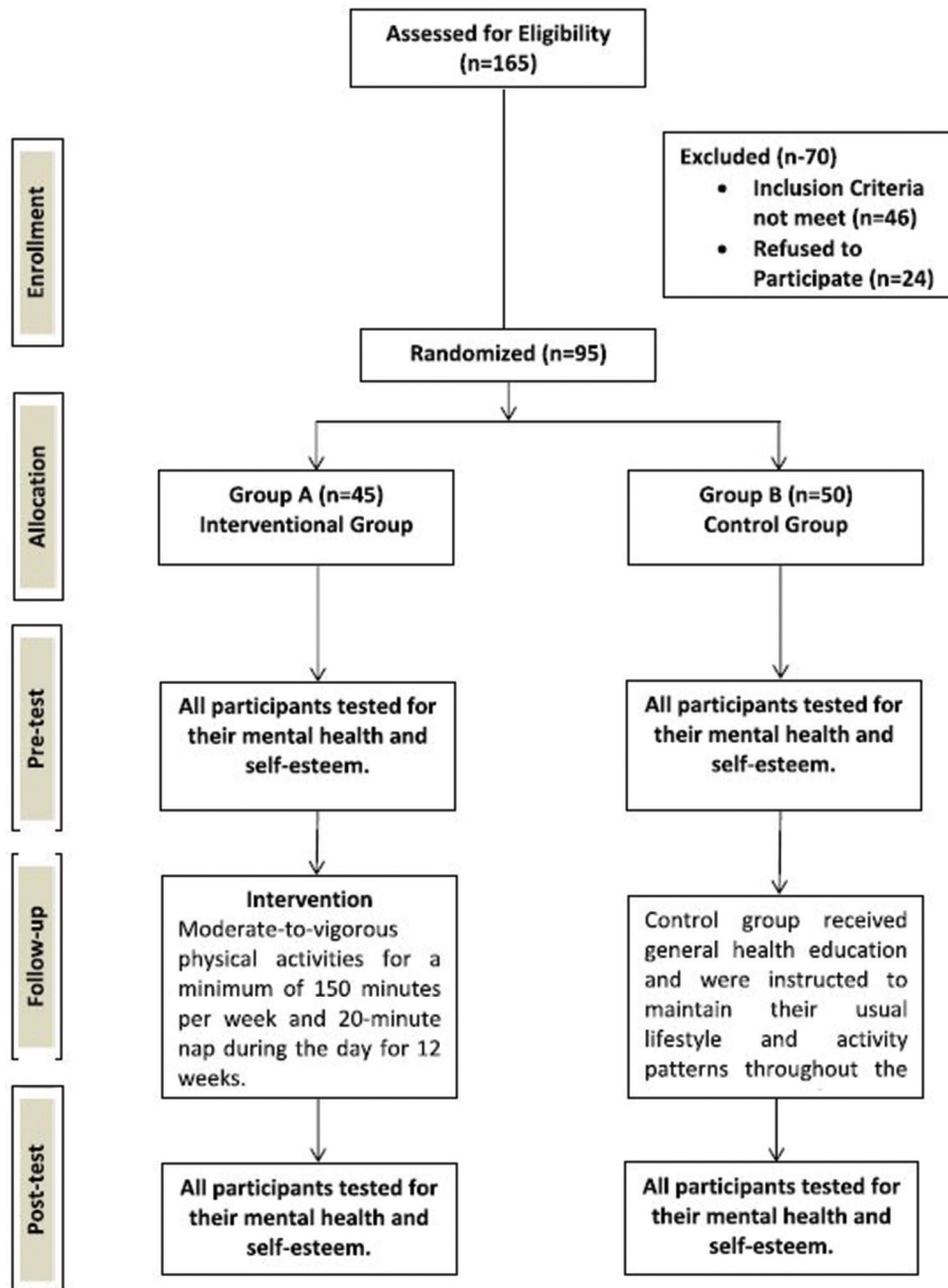


Figure 2: Study plan diagram

combined physical activity and daytime nap program throughout the duration of the study. The Figure 1 provide the conceptual theoretical framework.

### Procedure

This study started in the fourth week of the academic year. An open invitation was circulated to participate in this study. Flyers were fixed at the student assembly points, cafeteria, library, gymnasium, and common room. Interested participants were selected based on inclusion and exclusion criteria. The procedure, associated benefits, and relative risks of the study were

explained to all participants. They were free to leave the study at any stage without any penalties. Participants were free to ask any questions regarding the conducted study. The study procedure was followed as mentioned in the Figure 2. Before participation, they were asked to sign a written consent and provide demographic information. MHI and Self-Esteem questionnaire's hardcopy was also distributed to all participants to fill in the appropriate responses. Demographic information was also taken from all participants. In the initial phase, more than 160 participants volunteered for the study. Participants were randomly divided into two groups,



that is, the intervention group and the control group. The intervention group participated in physical activities, sports activities, and recreational sports, and took a short nap of 20 min per day, three times a week for 12 weeks, whereas the control group was free to do daily activities without participation in any type of sports activity or any extra physical activity that belongs to moderate level as per the directive of WHO and daytime nap. After the completion of 12 weeks, researchers found that some participants from the intervention group left the study, whereas some of them did not follow the study procedure fully. Some participants from the control group did not turn up to complete the study. At this stage, participants from both groups were requested to fill out the MHI and Self-Esteem questionnaire as accurately as they could at that time. Twelve weeks before and after, data were statistically analyzed to compare the effects of intervention on both groups.

### Ethical consideration

Ethical approval was obtained from the Institutional Review Board of Fiji National University, (FNU-HREC-23-8). Fiji.

This study was conducted in line with the Principles of the Helsinki Declaration. Each participant provided written informed consent before participation in the study.

### Statistical analysis

For this study, the MHI and Self-Esteem data were used. The measured outcomes of intervention and control groups were compared using a related-samples Wilcoxon signed rank test with non-normally distributed data (Shapiro–Wilk test  $P > 0.05$ ). Results are presented as mean and standard deviation (std. dev.), test statistics, standard error, standardized test statistic, and asymptotic sig. (2-sided test). The data from the intervention group and the control group were individually analyzed. Pre- and post-intervention between control and intervention groups for mental health and self-esteem was compared by samples Mann–Whitney  $U$  test. Altogether, data between pre-and post-tests for mental health and self-esteem were compared by independent-samples Mann–Whitney  $U$  test. The statistical asymptotic significance (2-sided test) of the related-samples Wilcoxon

**Table 1: Related-samples Wilcoxon signed rank test comparison between mental health and self-esteem in the control group**

Variables	Test	Mean±Std. Dev.	Test statistics	Standard error	Standardized test statistic	Asymptotic sig. (2-sided test)
Mental health	Pre	48.20±7.47	1225	99.54	6.15	0.072
	Post	49.12±6.20				
Self-esteem	Pre	23.44±1.42	1275	103.49	6.16	0.061
	Post	25.12±6.20				

**Table 2: Related-samples Wilcoxon signed rank test comparison between mental health and self-esteem in the intervention group**

Variables	Test	Mean±Std. dev.	Test statistics	Standard error	Standardized test statistic	Asymptotic sig. (2-sided test)
Mental health	Pre	55.00±11.68	496	50.82	4.89	<0.001*
	Post	59.16±10.43				
Self-esteem	Pre	22.93±1.80	404	45.92	3.73	<0.001*
	Post	25.62±3.35				

\*Significant at 0.05 level

**Table 3: Baseline comparison between control and intervention groups for mental health and self-esteem by samples Mann–Whitney  $U$  test**

Variables	Groups	Mean rank	Test statistics	Standard error	Standardized test statistic	Asymptotic sig. (2-sided test)
Mental health	A	34.48	449.00	133.88	-5.05	<0.001*
	B	63.02				
Self-esteem	A	37.53	601.50	131.39	-3.98	<0.001*
	B	59.63				

\*Significant at 0.05 level

**Table 4: Post-intervention comparison between control and intervention groups for mental health and self-esteem by samples Mann–Whitney  $U$  test**

Variables	Groups	Mean rank	Test statistics	Standard error	Standardized test statistic	Asymptotic sig. (2-sided test)
Mental health	A	34.54	452.00	133.56	-5.04	<0.001*
	B	62.96				
Self-esteem	A	37.65	607.50	130.29	-3.97	<0.001*
	B	59.50				

\*Significant at 0.05 level

**Table 5: Comparison between pre-and post-tests for mental health and self-esteem altogether by independent-samples Mann–Whitney *U* test**

Variables	Test	Mean rank	Test statistics	Standard error	Standardized test statistic	Asymptotic sig. (2-sided test)
Mental health	Pre	83.77	5626.50	378.08	2.95	0.003*
	Post	107.23				
Self-esteem	Pre	82.12	5783.50	370.20	3.43	<0.001*
	Post	108.88				

\*Significant at 0.05 level

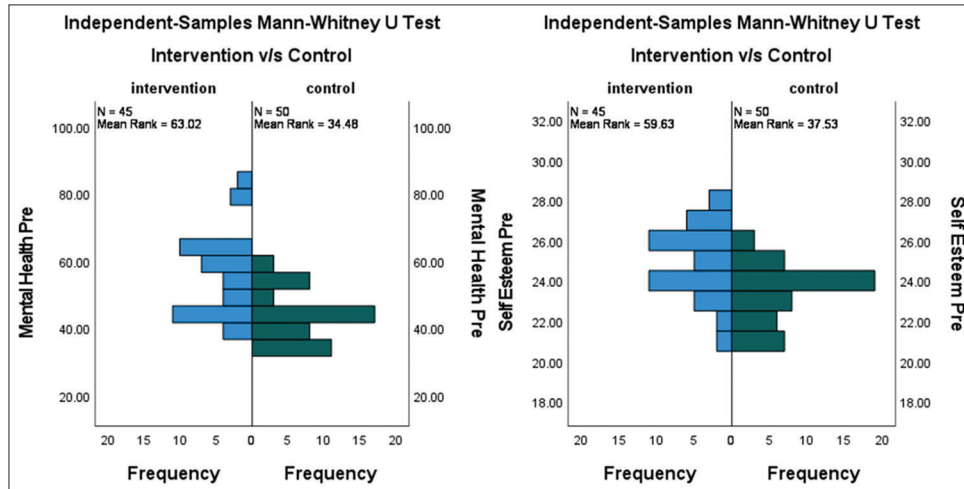


Figure 3: Baseline comparison between intervention and control groups for mental health and self-esteem

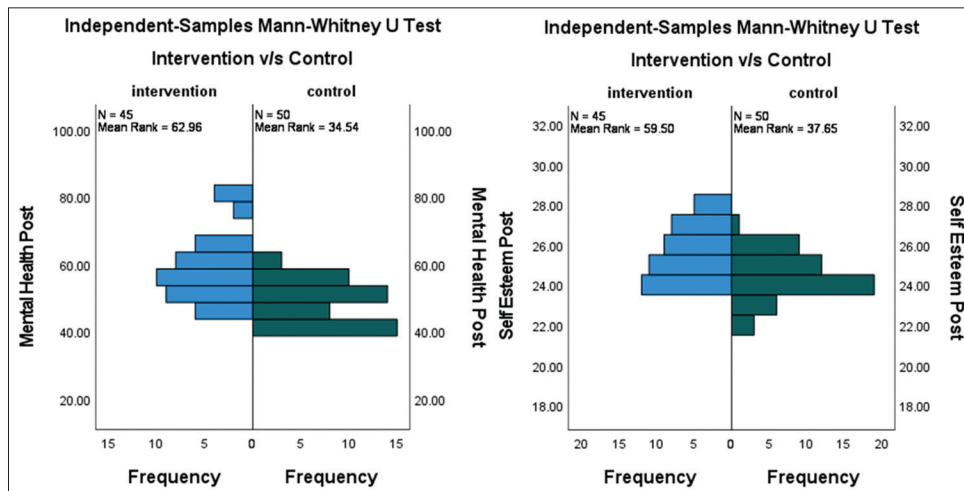


Figure 4: Post-intervention comparison between intervention and control groups for mental health and self-esteem

signed rank test and independent-samples Mann–Whitney *U* test were determined. A probability less than 0.05 indicated statistical significance. All data analyses were performed using the IBM Statistical Package for the Social Sciences (IBM SPSS) v26.0 for Windows (Armonk, New York, United States).

## Results

Table 1 reveals no significant differences between the pre-and post-tests for mental health ( $P = 0.072$ ) and self-esteem ( $P = 0.061$ ) in the control group.

Results showed that the mean scores ( $49.12 \pm 6.20$ ) in the post-test were higher than the pre-test scores ( $48.20 \pm 7.47$ ) for mental health. Self-esteem scores were greater after intervention ( $25.12 \pm 6.20$ ) than before intervention ( $23.44 \pm 1.42$ ). There was no significant improvement in mental health and self-esteem in the control group.

Table 2 reveals significant differences between the pre-and post-tests for mental health ( $P \leq 0.001$ ) and self-esteem ( $P \leq 0.001$ ) in the intervention group. The results showed that the mean scores ( $59.16 \pm 10.43$ )

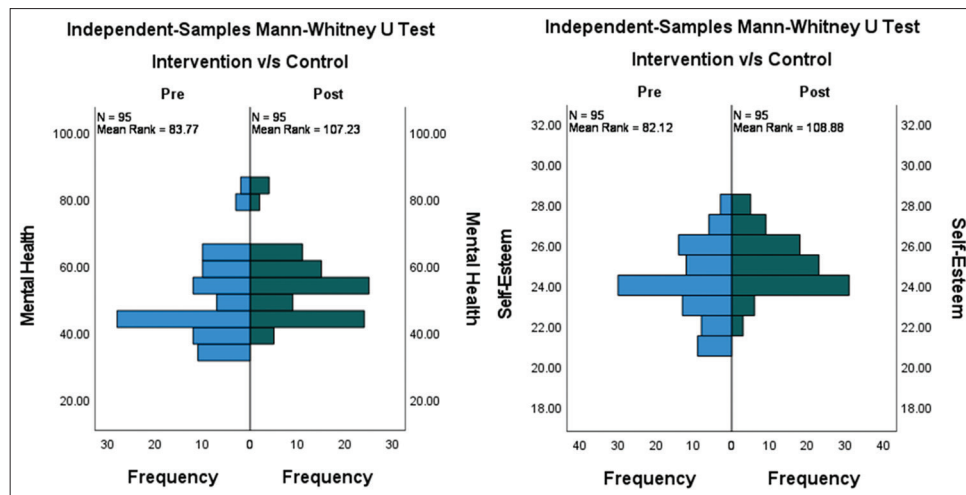


Figure 5: Comparison between pre- and post-intervention for mental health and self-esteem

in the post-test were higher than the pre-test scores ( $55.00 \pm 11.68$ ) for mental health. Self-esteem scores were greater after intervention ( $25.62 \pm 3.35$ ) than before intervention ( $22.93 \pm 1.80$ ). There was significant improvement in mental health and self-esteem as an effect of exercise and a nap intervention in the intervention group.

Table 3 demonstrates significant differences between control and intervention groups for mental health ( $P \leq 0.001$ ) and self-esteem ( $P \leq 0.001$ ) at baseline data. The results showed that the mean rank (63.02) in the intervention group was higher than in the control group (34.48) for mental health. Self-esteem mean rank was greater in the intervention group (59.63) than in the control group (37.53). There was a significant difference in mental health and self-esteem at the baseline measurement as indicated in Figure 3.

Table 4 demonstrates significant differences between control and intervention groups for mental health ( $P \leq 0.001$ ) and self-esteem ( $P \leq 0.001$ ) in post-intervention data. The results showed that the mean rank (62.96) in the intervention group was higher than in the control group (34.54) for mental health after intervention. Self-esteem mean rank was greater in the intervention group (59.50) than in the control group (37.65) after the intervention of exercise and a nap as indicated in Figure 4.

Table 5 shows significant differences between the pre-and post-tests for mental health ( $P = 0.003$ ) and self-esteem ( $P \leq 0.001$ ) as data (pre and post) combined. The table exhibits that mental health has a higher mean rank after intervention than baseline data. Self-esteem has a greater mean rank after intervention than before the intervention. Thus, there was an improvement in mental health and self-esteem as an effect of 12 weeks of exercise and a nap intervention as indicated in Figure 5 as well.

## Discussion

This study aimed to determine the effect of physical activity and daytime naps on mental health among healthy participants. The result of the study revealed significant differences between the pre-and post-tests for mental health and self-esteem in the intervention group. The results showed that the mean scores in the post-test were higher than the pre-test scores for mental health and self-esteem. There was significant improvement in mental health and self-esteem as an effect of exercise and daytime naps intervention in the interventional group. Significant differences also existed between control and intervention groups for mental health and self-esteem in post-intervention data. The results showed that the mean rank in the intervention group was higher than in the control group for mental health and self-esteem after the intervention of exercise and daytime naps as indicated in Figure 4. Significant differences were observed between the pre- and post-tests for mental health and self-esteem as data (pre and post) combined. The findings exhibited that mental health and self-esteem had a higher mean rank after intervention. Thus, there was a significant improvement in mental health and self-esteem as an effect of 12 weeks' exercise and daytime naps intervention among healthy participants as indicated in Figure 5.

The effect of physical activity and daytime naps improved the mental health and self-esteem among healthy participants. The association between physical activity and mental health has been extensively studied in diseased populations, but not in healthy participants. Some of these earlier studies' conclusions are consistent with our findings. Physical activity is widely acknowledged as an important role in the prevention and management of mental disorders such as depression and anxiety, as well as the promotion of

mental health.<sup>[17]</sup> A meta-analysis confirmed that the effect of physical activity on depression and anxiety in nonclinical people revealed that physical activity moderately reduced depressive symptoms and anxiety to a lesser extent.<sup>[18]</sup> It has been discovered that exercise reduces depression symptoms than no treatment, placebo, or other interventions such as meditation. These findings were regarded as supporting the conclusion that “exercise is modestly more effective than a control intervention in lowering depressive symptoms.”<sup>[19]</sup> A systematic review conducted by Pearce *et al.*<sup>[20]</sup> involving 191,130 participants found a significant inverse relationship between physical activity levels and depression risk, suggesting that individuals engaging in at least half the recommended volume of physical activity had an 18% lower risk of developing depression compared to inactive individuals. This finding aligns with that of Heissel *et al.*,<sup>[21]</sup> who reported large effect sizes (SMD = -0.946) for exercise interventions in treating depressive symptoms across 41 studies involving 2,264 participants. Rodriguez-Ayllon *et al.*<sup>[22]</sup> conducted a systematic review encompassing 114 studies, finding a small but significant overall effect of physical activity on mental health outcomes (effect size = 0.173). Physical activity is an excellent method for lowering unpleasant feelings and may therefore be used to promote better mental health among nonclinical populations.<sup>[23]</sup> Physical activity enhances mental health by decreasing anxiety, depression, and negative mood and by enhancing self-esteem and cognitive performance.<sup>[24]</sup> Three types of physical activity (domestic chores, stretching, and resistance training) were related to a reduction in depressive symptoms, whereas stretching and resistance training were associated with a reduction in anxiety.<sup>[25]</sup> Self-esteem is the key element of mental health.

The research strongly supports the idea that physical activity has a positive impact on mental health in different groups of people. The beneficial effects in preventing depression and anxiety are noticeable even with minimal participation in physical activity. However, additional investigation is necessary to examine the underlying mechanisms through which physical activity affects mental health outcomes and determine the most effective exercise recommendations customized to individual requirements. Incorporating physical activity into mental health treatment procedures has the potential to increase therapeutic outcomes and improve overall well-being.

Engaging in physical activity has a beneficial impact on self-esteem in individuals of different groups. The available evidence indicates a positive association between higher levels of physical exercise and enhanced self-esteem. However, it is important to note that the quality of studies conducted on this topic differs greatly. A systematic review by Gualdi-Russo *et al.*<sup>[26]</sup>

involving 28 studies highlighted a consistent positive association between physical activity and self-esteem among adolescents. This finding aligns with broader literature, suggesting that physical activity can foster a positive body image, which is crucial for self-esteem during adolescence—a developmental period marked by significant psychological changes. Biddle and Asare consolidated information from various evaluations on the influence of physical activity on mental health outcomes, including depression, anxiety, and self-esteem.<sup>[27]</sup> They conclude that although the available data are limited, there are slight to moderate positive effects of physical activity in lowering symptoms of depression and anxiety, while also improving self-esteem. The suggestion is substantiated by Raglin, who observed that consistent participation in physical activity is associated with enhancements in emotional well-being and self-esteem.<sup>[28]</sup> Furthermore, the evidence indicates that the surrounding environment is significant. For instance, participating in “green exercise,” which involves physical activity in natural settings, has been proven to result in more substantial enhancements in mood and self-esteem when compared to indoor activities.<sup>[29]</sup> These findings highlight the significance of taking into account contextual influences when creating interventions that aim to enhance self-esteem through physical activity.

This is the first study to explore the effect of daytime naps and physical activity on mental health and self-esteem among healthy participants. This study bolsters the evidence for the effect of daytime naps and physical activity and extends the association to mental health and self-esteem. Daytime napping has been associated with cognitive benefits as well as possible risks for mental health, specifically in regard to depression and anxiety. In a systematic review conducted by Duthell *et al.*,<sup>[30]</sup> data from 11 research including 381 participants were analyzed. The analysis found that short naps, with an average duration of around 55 min had a significant positive effect on cognitive performance after the nap. Specifically, the naps were found to increase alertness and executive function. This finding is consistent with a meta-analysis conducted by Leong *et al.*,<sup>[31]</sup> which examined 60 samples from 54 studies. The analysis revealed a moderate overall effect size (Cohen’s *d* = 0.379) for the improvement of cognitive function as a result of napping. Significantly, research has shown that naps have a positive impact on declarative memory and alertness, indicating that napping may have an important function in the process of consolidating memories. A recent systematic review conducted by Li *et al.*<sup>[32]</sup> found evidence of an inverted U-shaped association between the duration of naps and cognitive health in older adults. The review suggests that short to moderate naps have positive effects, whereas long naps may have negative effects. This finding highlights the intricate nature of the relationship between



napping and cognitive health, which is influenced by factors such as age and health status.

The study indicates that taking daytime naps can have positive impacts on cognitive performance; however, it may also present risks to mental health if not properly regulated. The contrasting nature of napping, which can improve cognitive function but also potentially worsen depression symptoms, emphasizes the need for personalized treatments for daytime sleep habits. Additional investigation is necessary to clarify the most effective lengths and timings of naps that optimize cognitive advantages while avoiding adverse psychological effects. Gaining a comprehensive understanding of these processes is essential for formulating efficacious interventions targeted at enhancing mental well-being through sleep techniques.

The effect of daytime naps on self-esteem is currently constrained and limited. Although certain studies indicate a positive relationship between better sleep quality and higher self-esteem, the specific influence of daytime napping on self-esteem is not well-established. Therefore, our study was conducted to clarify these connections. Our findings revealed that daytime naps significantly enhance self-esteem. Our findings are consistent with those of Williams *et al.*,<sup>[33]</sup> who investigated the relationship between habitual short sleep duration and subjective health perceptions among adults aged 40–79 years. They suggest that subjective perceptions of sleep quality may have implications for broader psychological constructs, including self-esteem. According to Chua *et al.*,<sup>[34]</sup> individuals with obstructive sleep apnea often suffer from pronounced daytime drowsiness and exhaustion, which can negatively impact their psychological well-being and self-esteem. The impact of daytime napping on self-esteem is further complicated by individual differences in sleep patterns and psychological resilience. Iskander *et al.*<sup>[35]</sup> determined standard values for the time it takes for healthy persons to fall asleep, known as sleep latency. Their findings suggest that insufficient sleep at night can result in heightened tiredness throughout the day and additional daytime naps. Therefore, the relationship between napping duration and self-esteem may be mediated by the quality of nighttime sleep. Bugueño *et al.*<sup>[36]</sup> established a link between substandard sleep quality in high school students and their academic performance, which in turn has an indirect impact on their self-esteem by influencing their perceived academic ability. This indicates that the consequences of daytime napping go beyond only being more awake in the moment and also have an impact on wider areas such as academic achievement and social relationships.

The relationship between daytime napping and self-esteem is complex and has many different aspects.

Short naps have been found to have positive effects on mental health and self-esteem. However, frequent napping may indicate underlying psychological distress or poor sleep quality, which can negatively impact self-esteem.

### Limitations and recommendations

The study was conducted on a very homogeneous sample of healthy adults, which may limit its applicability to other populations, such as those with pre-existing mental health disorders, older folks, or those with physical limitations. Self-reported questionnaires measured sadness, anxiety, stress, and self-esteem. These extensively used and verified techniques may be prone to self-reporting biases and mistakes. Only 12 weeks were studied to assess the intervention's effects. It is unknown if the observed gains in mental health and self-esteem will last or if other interventions or maintenance techniques will be needed. Diet, sleep quality, and social involvement may also affect mental health and self-esteem; however, the study did not examine them. To confirm the findings, the study used subjective self-reported measures rather than objective physiological or behavioral measurements (e.g., actigraphy, electroencephalography).

Future research should examine the effects of combined physical activity and napping intervention in more diverse populations, such as those with pre-existing mental health conditions, older adults, and those with physical disabilities. A mix of self-reported measurements, objective physiological tests, and behavioral observations would better understand the intervention's effects on mental health and self-esteem. Extended research duration and long-term follow-up assessments would assist in determining the intervention's sustainability and establish maintenance techniques to maintain mental health and self-esteem benefits. Examination of other lifestyle factors, including nutrition, sleep quality, and social involvement, could reveal the processes behind the reported improvements and inform more targeted therapies. The cost-effectiveness and feasibility of adopting the combined physical activity and sleeping intervention in real-world settings could guide policy decisions and public health priorities.

### Conclusion

The findings from this study on the effect of regular physical activities and daytime nap intervention on enhancing mental health and self-esteem in healthy participants have important implications for health policy and public health initiatives.

Firstly, the study aligns with the key objectives outlined

in the WHO Mental Health Action Plan 2013–2030, which emphasizes the importance of promoting mental well-being and preventing mental health conditions. Significant improvements in depression, anxiety, stress, and self-esteem observed in the combined intervention group directly support the plan's goal of enabling people to attain the highest standard of mental health and well-being.

Additionally, the study's outcomes contribute to the evidence base for the WHO's Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020. By demonstrating the synergistic benefits of physical activity and daytime napping on mental health, the findings provide valuable insights to inform policies and programs aimed at promoting healthy lifestyles and reducing the burden of non-communicable diseases, which often have mental health components.

From a national health policy perspective, the results of this study are well-aligned with the priorities outlined in the U.S. National Prevention Strategy, which prioritizes the importance of mental and emotional well-being. The study's emphasis on accessible, non-pharmacological interventions to enhance mental health and self-esteem aligns with the strategy's focus on empowering individuals to make healthy choices.

In summary, the robust evidence generated by this study on the combined effects of physical activity and daytime napping on mental health and self-esteem in healthy individuals holds significant promise for informing future health policies and public health initiatives. These findings can contribute to the development of comprehensive, holistic approaches to promoting mental wellness and overall quality of life, ultimately supporting the overarching goals of national and global health agendas.

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### Conflicts of interest

There are no conflicts of interest.

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