

## Assaying the effect of regular physical exercises on the general health of prisoners of the Vocational Training and Occupational Therapy Camp and Khorramabad Central Prison (2023-2024)

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### ABSTRACT

This semi-experimental study investigates the effect of regular physical exercises on the general health of the prisoners of the vocational training and occupational therapy camp and Khorramabad Central Prison (2023-2024). Its statistical population included the prisoners of the vocational training and occupational therapy camp and the Khorramabad Central Prison. The sample size was calculated based on the Cochran sample size formula. Sampling was based on the clustering of different prison wards. The data collection tools were the demographic questionnaire and the GHQ general health questionnaire; the results were analyzed with SPSS software. The results showed that regular physical exercises have a positive effect on the prisoners' general health. The scores of physical symptoms, including anxiety, insomnia, dysfunction, and depression in two intervention and control groups, show significant changes before and after the exercises. The average score of general health was also affected in particular by these interventions. However, there is no significant interaction effect between groups and demographic variables such as age, gender, and socio-economic status. This means that these factors are not influential and do not independently affect the results of the intervention.

**Key words:** Regular Physical Exercises, General Health, Anxiety, Insomnia, Camp Prisoners

### INTRODUCTION

The World Health Organization defines general health as a state of complete physical, mental, and social well-being (1). In public health, physical fitness is a crucial concept, especially during childhood and adolescence. Physical fitness, which reflects regular engagement in physical exercise, is a relative condition enabling individuals to perform physical tasks efficiently without undue fatigue, while still retaining sufficient energy for recreational activities (2, 3). Participating in physical activity is essential for physical, mental, and social development. It can help alleviate problems such as anxiety and insomnia and foster social connections—such as among camp prisoners—by creating opportunities to develop social skills and offering educational experiences with cultural and social benefits (4).

Physical activity, experienced by the vast majority of people as a social phenomenon, is widely recognized as a key factor in shaping culture and social behaviors (5). In this context, advancements in modern communication technologies have further amplified the influence of physical activity in social life (6, 7). Physiologically, physical activity promotes relaxation and a sense of calm. Research indicates that regular exercise contributes to increased happiness, vitality, and self-confidence. It enhances inner satisfaction and cultivates a feeling of accomplishment (8). Additionally, by improving body shape and posture, physical activity directly benefits overall physical health (9).

Physical activity also offers psychological benefits by enhancing our sense of competence and effectiveness. During regular exercise, individuals recognize that they are engaged in a meaningful activity, which fosters a feeling of self-worth (10). Increasing physical activity can help reduce healthcare costs and lower mortality rates. Because exercise programs can often be delivered at relatively low cost, promoting and encouraging them publicly is a practical strategy for improving overall health (11). Research has demonstrated (12) that aerobic exercise plays a crucial role in enhancing the mental health of women struggling with addiction. Additionally, another study found that young people who participate in physical activities report higher levels of positive outcomes, including improved self-image, physical health, quality of life, family relationships, and peer connections.

Engaging in regular group sports can positively influence the personalities of camp prisoners, aiding their adaptation to both prison life and reintegration into society after release. This is facilitated through the promotion of good morals, the introduction of positive role models, and other constructive influences (13). Social adjustment refers to an individual's ability to interact effectively with others, characterized by respecting others' rights, demonstrating kindness, and refraining from aggressive behavior (14). Prisoners often have ample time and energy, which can lead to harmful activities such as tattooing, fighting, and misconduct. By offering structured opportunities and dedicated time for physical activity, these risky behaviors can be diminished. Furthermore, sports facilities and group exercises provide a conducive environment for guidance and counseling, as participants engaged in enjoyable activities tend to be more receptive to rules and reality, even indirectly. This approach helps reduce conflicts and prevent dangerous behaviors (15). From a sociological standpoint, sport is viewed as an effective method for managing psychological stress. Regular group exercise can help eliminate stress-related harmful hormones, reduce anxiety and depression, and build the body's resilience to withstand both mental and physical challenges (16).

A prison functions as a small society that encompasses many of the needs found in larger communities. Although it is a confined and closed environment, the individuals within are still members of the broader society, making it crucial to address their diverse physical and spiritual needs. Offering meaningful ways to occupy their leisure time is vital to preventing the spread of criminal ideas, reducing social harms, and ultimately supporting offender rehabilitation (17, 18). Achieving this goal requires implementing strategies to enhance the well-being of those who are unhealthy or disruptive, one of which is providing opportunities for regular physical exercise among prisoners (19, 20). Encouraging physical activity plays a key role in promoting overall health within the prison community.

Health is a topic discussed across all cultures, with its definition varying somewhat based on the shared understanding and cultural context of each society. While health is often associated primarily with physical well-being, the growth and development of any society depend on health in its physical, mental, and social dimensions. Research indicates that exercise has a significant positive impact on prisoners. Physical activity benefits both individual prisoners and the prison community by improving overall well-being (21).

Prisoners who engage in regular exercise tend to experience lower levels of depression, stress, and anxiety, making physical activity a strategic tool for coping with incarceration. Additionally, some researchers view exercise as an effective method for managing psychological stress. Regular physical activity can help reduce harmful stress hormones, alleviate anxiety and depression, and strengthen the body's resilience against both mental and physical pressures (16, 22).

Although the World Health Organization emphasizes the importance of physical activity for the health and well-being of prisoners, numerous studies confirm that participation in physical and sports activities plays a vital role in occupying leisure time and significantly improves the physical, mental, and social health of all members of society—especially prisoners (23, 24). Moreover, if we recognize that offenders are individuals who, for various reasons, have deviated from their natural human path and require rehabilitation, then exercise emerges as an essential and effective factor in their physical and mental reconditioning (22, 25). Accordingly, this study aimed to investigate the effects of regular physical exercise on the general health of prisoners.

### **Research Method**

This study employed a quasi-experimental design with pre-test and post-test measures, including both intervention and control groups. The statistical population comprised prisoners from the Vocational Training and Occupational Therapy Camp and the Central Prison of Khorramabad County. The sample size was determined using Cochran's formula, and cluster sampling was conducted across various prison wards. The standard deviation of the overall general health score was 12.36. Applying this value in the sample size formula, with a significance level (alpha) of 0.05, a power of 80%, and a margin of error (d) of 2, the required sample size was estimated at 50 participants per group. Participants were then randomly assigned to either the intervention group (wards 1 to 4 of the camp) or the control group (wards 1 to 4 of the central prison).

The inclusion criteria were willingness to participate, literacy (ability to read and write), male gender, and conviction for financial crimes, theft, or minor drug possession offenses (non-addicted individuals). Exclusion criteria included prisoners with physical disabilities, drug addiction, severe chronic illnesses, serious criminal offenses, incomplete consent forms, absence from more than two educational sessions, and incomplete questionnaire responses.

### **Research Instrument**

#### **General Health Questionnaire (GHQ)**

The General Health Questionnaire (GHQ) was originally developed by Goldberg in 1972. While the full version contains 60 items, shorter forms with 30, 28, and 12 items have been widely used in various studies. According to researchers Mary and Williams (1985) and Shamsunder et al. (1986), as cited by Taghavi, the different GHQ versions exhibit high validity and reliability, with the 12-item form performing nearly as well as the 60-item version. This study utilized the 28-item form, which is divided into four subscales, each comprising 7 questions.

Taghavi assessed the reliability of the GHQ using three methods: test-retest, split-half, and Cronbach's alpha, which yielded reliability coefficients of 0.93, 0.70, and 0.90, respectively. For validity assessment in this study, concurrent validity and factor analysis were employed. The concurrent validity of the GHQ was demonstrated through its simultaneous administration alongside the Middlesex Hospital Questionnaire (MHQ), resulting in a correlation coefficient of 0.55.

All data analysis processes were carried out using SPSS software, version 25.

### **Research Objectives**

## General Objective

To determine the effect of *regular physical exercises* on the *general health* of prisoners at the Vocational Training and Occupational Therapy Camp and the Central Prison of Khorramabad, 2023–2024.

## Specific Objectives

1. To determine and compare the average scores of physical symptoms in the intervention and control groups before and after the *regular physical exercise* intervention on the general health of prisoners.
2. To determine and compare the average scores of *anxiety* and insomnia in the intervention and control groups before and after the *regular physical exercise* intervention on the general health of prisoners.
3. To determine and compare the average scores of functional impairment in the intervention and control groups before and after the *regular physical exercise* intervention on the general health of prisoners.
4. To determine and compare the average scores of depression in the intervention and control groups before and after the *regular physical exercise* intervention on the general health of prisoners.
5. To determine and compare the average scores of general health in the intervention and control groups before and after the *regular physical exercise* intervention on the general health of prisoners.
6. To determine and compare the average scores of general health in the intervention and control groups before and after the *regular physical exercises* intervention on the general health of prisoners, based on demographic factors (age, education, number of family members, etc.).

## Findings

Based on the assessments conducted, most participants were between 35 and 50 years old. The majority held a high school diploma, and most participants were married.

**Table 1- Results of the comparison of the average score of the physical symptoms of the participants in both groups before and after the intervention**

| Variable                     | Before intervention |             | P    | After intervention |              | P            |
|------------------------------|---------------------|-------------|------|--------------------|--------------|--------------|
|                              | Pre-test            | Post-test   |      | Pre-test           | Post-test    |              |
| Feeling good and healthy     | 30.4 ± 11.4         | 27.4 ± 10.7 | 0.28 | 34.3 ± 12.1        | 39.17 ± 14.7 | 0.00***      |
| Need for strengthening drugs | 18.9 ± 4.7          | 17.5 ± 4.3  | 0.22 | 11.3 ± 2.1         | 11.1 ± 2.1   | 0.33         |
| Feeling weak and sluggish    | 15.2 ± 3.1          | 11 ± 3.4    | 0.55 | 9.8 ± 3.1          | 5.9 ± 2.2    | 0.001**<br>* |
| Feeling sick                 | 22.1 ± 4.6          | 20.3 ± 4.3  | 0.48 | 12.1 ± 2.9         | 6.3 ± 1.9    | 0.00***      |
| Headache                     | 11.4 ± 2.8          | 12.2 ± 3.1  | 0.29 | 9.4 ± 1.9          | 4.3 ± 0.89   | 0.26         |
| Blow or pressure to the head | 18.3 ± 3.4          | 22.1 ± 4.5  | 0.87 | 14.9 ± 2.9         | 7.11 ± 1.11  | 0.63         |
| Feeling hot or cold in       | 33.3 ± 5.2          | 18.8 ± 3.4  | 0.59 | 6.11 ± 2.3         | 4.2 ± 1.9    | 0.001**<br>* |

**the body**

Based on the evaluations conducted, after the *regular physical exercises* intervention, the post-test group showed a significant reduction in physical symptoms related to the components of "feeling weak and sluggish; feeling ill; and feeling hot or cold" compared to the control group ( $p < 0.001$ ). Meanwhile, the component of feeling well and healthy in the post-test group significantly increased compared to the control group following the intervention ( $p < 0.001$ ) (see Table 1).

**Table 2- Regression results of the first target**

| Predicting variable | Unstandardized regression coefficient (B) | Standard error (SE) | Standardized regression coefficient ( $\beta$ ) | t statistic | Sig.  |
|---------------------|-------------------------------------------|---------------------|-------------------------------------------------|-------------|-------|
| Physical symptoms   | 0.109                                     | 0.022               | 0.141                                           | 2.402       | 0.001 |

In Table 2, the standardized coefficients indicate that all physical variables have a significant relationship with the general health of prisoners after the intervention. The standardized coefficient shows that physical variables have a significant effect on prisoners' general health with a beta value of  $\beta = 0.141$ .

**Table 3- Results of comparing the average score of anxiety and insomnia of the participants in both groups before and after the intervention**

| Variable                  | Before intervention |                   | P    | After intervention |                   | P            |
|---------------------------|---------------------|-------------------|------|--------------------|-------------------|--------------|
|                           | Pre-test            | Post-test         |      | Pre-test           | Post-test         |              |
| Insomnia                  | 14.2<br>$\pm 2.6$   | 15.4<br>$\pm 2.9$ | 0.54 | 10.2<br>$\pm 2.1$  | 6.41<br>$\pm 1.6$ | ***0.0<br>0  |
| Anxiety                   | 29.6<br>$\pm 3.7$   | 29.4<br>$\pm 3.6$ | 0.99 | 21.2<br>$\pm 2.8$  | 17.2<br>$\pm 2.5$ | ***0.0<br>0  |
| Waking up suddenly        | 22.1<br>$\pm 4.5$   | 21.3<br>$\pm 4.2$ | 0.41 | 16.4<br>$\pm 3.1$  | 10.2<br>$\pm 2.6$ | ***0.0<br>01 |
| Feeling pressure          | 12.1<br>$\pm 2.1$   | 12 $\pm 2.1$      | 0.65 | 9.5 $\pm 1.7$      | 7.4<br>$\pm 1.5$  | 0.22         |
| Nervousness and moodiness | 16.4<br>$\pm 2.6$   | 16.1<br>$\pm 2.3$ | 0.44 | 10.4<br>$\pm 1.9$  | 7.4<br>$\pm 1.5$  | ***0.0<br>0  |
| Afraid and terrified      | 15.3<br>$\pm 2.5$   | 15.6<br>$\pm 2.6$ | 0.88 | 7.1 $\pm 1.6$      | 5.5<br>$\pm 0.91$ | 0.63         |
| Worry                     | 21.2<br>$\pm 3.2$   | 20.4<br>$\pm 2.9$ | 0.23 | 13.6<br>$\pm 2.1$  | 9.3<br>$\pm 1.79$ | 0.37         |

Based on the evaluations conducted, after the *regular physical exercises* intervention, the post-test group showed a significant decrease in the average scores of *anxiety* and *insomnia*, as well as related components such as "sleep disturbances, irritability, and moodiness," compared to the control group ( $p < 0.001$ ) (see Table 3).

**Table 4- Regression results of the second target**

| Predicting variable        | Unstandardized regression coefficient (B) | Standard error (SE) | Standardized regression coefficient ( $\beta$ ) | t statistic | Sig.  |
|----------------------------|-------------------------------------------|---------------------|-------------------------------------------------|-------------|-------|
| Anxiety and insomnia score | 0.117                                     | 0.050               | 0.134                                           | 2.325       | 0.002 |

In Table 4, the standardized coefficients indicate that all *anxiety* and *insomnia* variables have a significant relationship with the general health of prisoners after the intervention. The standardized coefficient shows that *anxiety* and *insomnia* variables have a significant effect on prisoners' general health with a beta value of  $\beta = 0.134$ .

**Table 5- Results of comparing the average performance impairment score of the participants in both groups before and after the intervention**

| Variable                  | Before intervention |                    | P    | After intervention |                    | P        |
|---------------------------|---------------------|--------------------|------|--------------------|--------------------|----------|
|                           | Pre-test            | Post-test          |      | Pre-test           | Post-test          |          |
| Performance impairment    | 4.4<br>$\pm 1.2$    | 4.8<br>$\pm 1.4$   | 0.97 | 2.2<br>$\pm 0.89$  | 1.8<br>$\pm 0.78$  | ***0.001 |
| Entertaining              | 6.4<br>$\pm 1.1$    | 4.8<br>$\pm 0.79$  | 0.69 | 11.4<br>$\pm 1.8$  | 11.1<br>$\pm 1.6$  | 0.48     |
| Doing work patiently      | 24.3<br>$\pm 2.7$   | 20.1<br>$\pm 2.5$  | 0.88 | 31.9<br>$\pm 4.1$  | 31.4<br>$\pm 3.9$  | 0.33     |
| Good feeling with work    | 15.6<br>$\pm 3.1$   | 19.6<br>$\pm 4.2$  | 0.61 | 11.1<br>$\pm 1.9$  | 22.3<br>$\pm 2.1$  | ***0.001 |
| Satisfaction with work    | 22.4<br>$\pm 3.2$   | 16.1<br>$\pm 2.5$  | 0.78 | 20.5<br>$\pm 3.1$  | 19.6<br>$\pm 2.9$  | ***0.001 |
| Feeling useful            | 31.1<br>$\pm 3.4$   | 34.6<br>$\pm 3.7$  | 0.64 | 15.6<br>$\pm 2.2$  | 14.5<br>$\pm 2.1$  | ***0.00  |
| Ability to make decisions | 22.7<br>$\pm 2.4$   | 26.4<br>$\pm 2.96$ | 0.31 | 10.6<br>$\pm 1.6$  | 10.3<br>$\pm 1.5$  | ***0.001 |
| Enjoying daily activities | 15.4<br>$\pm 2.2$   | 15.9<br>$\pm 2.6$  | 0.41 | 27.1<br>$\pm 3.8$  | 34.02<br>$\pm 4.2$ | 0.40     |

Based on the evaluations conducted, after the *regular physical exercises* intervention, the post-test group showed a significant decrease in the average scores of functional impairment and a significant increase in positive related components such as “feeling good about work, satisfaction with work, feeling useful, and decision-making ability” compared to the control group or pre-test scores ( $p < 0.001$ ) (see Table 5).

**Table 6- Regression results of the third target**

| Predicting variable | Unstandardized regression coefficient (B) | Standard error (SE) | Standardized regression coefficient ( $\beta$ ) | t statistic | Sig. |
|---------------------|-------------------------------------------|---------------------|-------------------------------------------------|-------------|------|
|---------------------|-------------------------------------------|---------------------|-------------------------------------------------|-------------|------|

|                               |       |       |       |       |       |
|-------------------------------|-------|-------|-------|-------|-------|
| <b>Performance impairment</b> | 0.142 | 0.052 | 0.179 | 1.431 | 0.004 |
|-------------------------------|-------|-------|-------|-------|-------|

In Table 6, the standardized coefficients indicate that all functional impairment variables have a significant relationship with the general health of prisoners after the intervention. The standardized coefficient shows that functional impairment variables have a significant effect on prisoners' general health with a beta value of  $\beta = 0.179$ .

**Table 7- Results of comparing the average score of depression in the performance of participants in both groups before and after the intervention**

| Variable                                   | Before intervention |               | P    | After intervention |                | P            |
|--------------------------------------------|---------------------|---------------|------|--------------------|----------------|--------------|
|                                            | Pre-test            | Post-test     |      | Pre-test           | Post-test      |              |
| <b>Feeling worthless</b>                   | 21.6<br>± 2.7       | 22.1<br>± 2.8 | 0.42 | 14.2<br>± 1.4      | 10.4<br>± 1.1  | 0.001<br>*** |
| <b>Feeling hopeless</b>                    | 24.3<br>± 3.4       | 24.9<br>± 3.5 | 0.55 | 17.2<br>± 2.8      | 15.4<br>± 2.6  | 0.001<br>*** |
| <b>Worthlessness of life</b>               | 21.2<br>± 2.9       | 20.9<br>± 2.6 | 0.44 | 13.3<br>± 1.9      | 12.4<br>± 1.7  | 0.001<br>*** |
| <b>Suicide</b>                             | 26.9<br>± 3.3       | 25.5<br>± 3.2 | 0.27 | 21.2<br>± 2.9      | 19.14<br>± 2.5 | 0.001<br>*** |
| <b>Nervous disorders</b>                   | 15.5<br>± 2.4       | 15.9<br>± 2.6 | 0.77 | 14.1<br>± 2.3      | 12.3<br>± 2.1  | 0.54<br>***  |
| <b>Getting rid of life</b>                 | 21.8<br>± 2.2       | 21.6<br>± 2.1 | 0.89 | 16.1<br>± 1.7      | 14.2<br>± 1.55 | 0.001<br>*** |
| <b>The feeling of death or end-of-life</b> | 29.9<br>± 3.3       | 29.4<br>± 3.2 | 0.62 | 22.3<br>± 2.9      | 20.17<br>± 2.7 | 0.83<br>***  |

Based on the evaluations conducted, after the *regular physical exercises* intervention, the post-test group showed a significant decrease in the average scores of depression and related components such as “feelings of worthlessness, hopelessness, feeling that life is meaningless, suicidal thoughts, and desire to escape life,” compared to the control group ( $p < 0.001$ ) (see Table 7).

**Table 8- Results of the regression of the fourth target**



| Predicting variable | Unstandardized regression coefficient (B) | Standard error (SE) | Standardized regression coefficient ( $\beta$ ) | t statistic | Sig.  |
|---------------------|-------------------------------------------|---------------------|-------------------------------------------------|-------------|-------|
| Depression          | 0.117                                     | 0.050               | 0.151                                           | 2.325       | 0.002 |

In Table 8, the standardized coefficients indicate that all depression variables have a significant relationship with the general health of prisoners after the intervention. The standardized coefficient shows that depression variables have a significant effect on prisoners' general health with a beta value of  $\beta = 0.151$ .

**Table 9- Average scores of general health before and after the intervention of regular physical exercises**

| Variable               | Before intervention |               | P              | After intervention |           | P        |
|------------------------|---------------------|---------------|----------------|--------------------|-----------|----------|
|                        | Pre-test            | Post-test     |                | Pre-test           | Post-test |          |
| General Health         | 22.3<br>± 4.7       | 22.1<br>± 4.6 | 21.5<br>± 4.5  | 25.8<br>± 5.1      | 6.88      | ***0.001 |
| Physical symptoms      | 11.4<br>± 2.4       | 11.9<br>± 2.5 | 7.2<br>± 1.8   | 5.4<br>± 1.6       | 3.73      | ***0.00  |
| Anxiety and insomnia   | 8.2<br>± 1.9        | 8.9<br>± 2.2  | 4.3<br>± 1.4   | 4.1<br>± 1.2       | 2.88      | ***0.001 |
| Performance impairment | 7.49<br>± 1.3       | 6.5<br>± 1.1  | 3.44<br>± 0.77 | 2.54<br>± 0.78     | 2.69      | ***0.003 |
| Depression             | 10.6<br>± 1.4       | 10.9<br>± 1.5 | 6.4<br>± 0.89  | 4.2<br>± 0.78      | 4.59      | ***0.00  |

Based on the results, a significant difference was observed between pre-test and post-test scores across all components of prisoners' general health after the intervention (see Table 9). Accordingly, following the *regular physical exercise* intervention, the post-test group demonstrated better functioning and higher health scores compared to their pre-test performance. Therefore, *regular physical exercises* contribute to improving the general health of prisoners.

**Table 10- Average scores of general health before and after the intervention of regular physical exercises according to demographic factors**

| Variables | Source of variance              | Total squares | F     | Eta square | Probability value |
|-----------|---------------------------------|---------------|-------|------------|-------------------|
| Age       | Age                             | 46.96         | 0.844 | 0.003      | 0.640             |
|           | Groups                          | 5559.75       | 83.80 | 0.002      | 0.001             |
|           | Age and group interaction       | 79.78         | 1.155 | 0.007      | 0.288             |
|           | Error                           | 68.12         |       |            |                   |
| Education | Education                       | 79.42         | 1.24  | 0.007      | 0.027             |
|           | Groups                          | 5844.04       | 84.25 | 0.033      | 0.001             |
|           | Education and group interaction | 106.22        | 1.55  | 0.027      | 0.166             |
|           | Error                           | 69.69         |       |            |                   |



|                       |                                         |         |       |       |       |
|-----------------------|-----------------------------------------|---------|-------|-------|-------|
| <b>Marital status</b> | Marital status                          | 146.77  | 2.09  | 0.117 | 0.124 |
|                       | Groups                                  | 6341.45 | 97.55 | 0.221 | 0.001 |
|                       | Interaction of marital status and group | 84.33   | 1.22  | 0.66  | 0.304 |
|                       | Error                                   | 70.55   |       |       |       |

The results (Table 10) showed no significant interaction effects between group levels and demographic variables ( $p \geq 0.05$ ). In examining independent effects, except for the education variable ( $p < 0.05$ ), other demographic factors did not have a significant impact on the general health of prisoners. Additionally, the general health of prisoners was significantly influenced by group levels as an independent variable ( $p < 0.01$ ). Therefore, the study proceeded to compare the effects of different types of interventions on the general health of prisoners.

## Discussion

The results related to the study's first objective indicate significant improvements in physical symptom scores in both the intervention and control groups following the regular physical exercise program aimed at enhancing prisoners' general health. These findings are supported by various studies. For instance, Manuchi et al. (26) confirmed that regular physical activity can reduce symptoms of anxiety and depression. Research shows that prisoners participating in exercise programs experienced notable decreases in physical symptoms linked to stress and psychosomatic conditions. Benephant et al. (27) found that prison sports programs not only improve cardiovascular health but also alleviate general physical symptoms such as chronic pain and fatigue, with significant differences observed between intervention and control groups pre- and post-intervention. Similarly, Anne et al. (28) demonstrated that consistent exercise in prison leads to meaningful enhancements in both physical and mental health, positively affecting prisoners' quality of life. This study highlights the crucial role of physical activity in reducing physical symptoms and promoting overall health. Furthermore, Young et al. (29) reported that rehabilitation programs incorporating physical activity effectively improve prisoners' physical and mental well-being. Additionally, research by Aghamollaei et al. (30) showed that incarcerated individuals who engaged in physical activity exhibited higher levels of physical and mental health.

The findings related to the second objective reveal significant improvements in anxiety and insomnia scores in both the intervention and control groups following the regular physical exercise intervention targeting prisoners' general health. These changes can be attributed to the beneficial effects of physical activity on the nervous system and sleep quality. Extensive research supports the role of regular exercise in reducing anxiety symptoms. For instance, Malki Wiz et al. (31) found that participation in sports programs significantly lowered anxiety and depression levels among prisoners, suggesting exercise as an effective strategy for anxiety management in correctional settings. Additionally, Kandola et al. (32) demonstrated that regular physical activity improves sleep quality, especially in stressful environments like prisons, by reducing insomnia and promoting deeper, more restorative sleep, which in turn benefits mental well-being. Furthermore, Chalakot (33) highlighted that individuals with a history of insomnia experienced notable improvements in sleep quality and anxiety reduction through consistent exercise. These findings hold particular significance for managing mental health in high-stress settings such as prisons.

The results related to the third objective show significant changes in functional impairment scores in both the intervention and control groups before and after the regular physical exercise intervention targeting

prisoners' general health. These improvements likely stem from the positive effects of physical activity on the physical, mental, and social well-being of prisoners. Richer et al. (34) demonstrated that regular exercise, particularly in prison settings, enhances mental and physical health while reducing functional impairment scores. Their study also highlighted that exercise can improve social relationships and foster a greater sense of social participation. Similarly, Mimi et al. (35) found that prisoners engaged in sports programs achieved better general health scores and exhibited significant overall health improvements compared to a control group. The psychological and social benefits of exercise for prisoners were further supported by Franklin et al. (36), who showed that physical activity helps reduce stress and anxiety and boosts prisoners' well-being and self-confidence. In summary, current evidence supports regular physical exercise as an effective approach to enhancing prisoners' general health and reducing functional impairments.

The results related to the fourth objective indicate that depression scores in both the intervention and control groups changed significantly before and after the *regular physical exercise* intervention on prisoners' general health. These findings align with the study by Motz et al. (37) and suggest a positive effect of physical activity in reducing depressive symptoms in this vulnerable population. Dones et al. (38) also reported that exercise can directly reduce symptoms of depression. They noted that physical activity acts as a factor in increasing the production of brain chemicals such as endorphins, which can enhance feelings of happiness and relaxation. Therefore, existing evidence indicates that *regular physical exercise* can be used as an effective strategy to reduce depression and improve the general health of prisoners. Based on these results, it is recommended that regular exercise programs be incorporated as part of therapeutic interventions within prison systems.

The findings related to the fifth objective demonstrate that the average general health scores in both the intervention and control groups changed significantly before and after the regular physical exercise intervention among prisoners. Numerous studies have explored the link between physical activity and enhanced general health, consistently showing that regular exercise positively influences various health dimensions. For instance, Chander et al. (39) found that regular exercise programs significantly improved prisoners' general health scores, citing factors such as better cardiovascular health, reduced stress, and improved physical condition. Similarly, Lebner et al. (40) reported that physical activity has a direct impact on prisoners' mental and physical well-being, with consistent exercise participation leading to improved quality of life and greater life satisfaction. Together, this body of evidence supports the beneficial effects of regular physical exercise on prisoners' overall health. These results highlight the value of integrating regular exercise programs into therapeutic and rehabilitation efforts within prisons to enhance inmates' physical and psychological well-being.

The study results revealed no significant interaction effects between group membership and demographic variables ( $p \geq 0.05$ ), indicating that factors such as age, gender, and socioeconomic status do not meaningfully interact with the group outcomes. However, when examining independent effects, only education showed a significant influence on prisoners' general health ( $p < 0.05$ ). These findings suggest that the effects of the interventions—such as different exercise programs or psychological treatments—are consistent across various demographic subgroups. In other words, the programs' impact is uniformly significant and not moderated by individual characteristics. The notable effect of education on general health may reflect that individuals with higher education levels possess greater health-related knowledge and skills, which can contribute to better health outcomes. Supporting this, Arnett et al. (41) reported a similar independent effect of education on general health, with no significant influences found for other variables like age and gender.

## Conclusion

This study demonstrated that regular physical exercise positively impacts the general health of prisoners. Significant improvements were observed in scores related to physical symptoms, anxiety, insomnia, functional impairment, and depression in both the intervention and control groups before and after the exercise program. Notably, the average general health score also showed a marked enhancement following the intervention. However, the results indicated no significant interaction between the intervention effects and demographic variables such as age, gender, and socioeconomic status, suggesting these factors did not independently influence the outcomes.

Among the limitations of this research was the sampling from only two prisons, which may limit the generalizability of the findings to other prison populations. Additionally, other factors—such as mental health status, certain physical illnesses, or prisoners' past experiences—could have influenced the results.

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