Mental Health and Lifestyle Journal

Year 2026
Volume 4
Issue 2

Comparison of the Effects of Eight Weeks of Moderate-Intensity Circuit Training and Morning Exercise on the Mental Health of Permanent Staff of the Ground Forces of the Islamic Republic of Iran Army

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Article type:
Original Research

Article history:
Received 01 September 2025
Revised 22 November 2025
Accepted 27 November 2025
Published online 01 March 2026

ABSTRACT

The purpose of this study was to compare the effects of eight weeks of moderate-intensity circuit training with morning exercise on the mental health of permanent staff of the Ground Forces of the Islamic Republic of Iran Army. This study was a semi-experimental design with pretest–posttest and control and experimental groups using a pretest–posttest and control-group structure. The statistical population consisted of all permanent staff and trainees undergoing training courses at the Artillery and Missile Training Center of the Ground Forces. The sample size was determined based on inclusion criteria and using G*Power software as 45 participants (effect size = 0.45, statistical power = 0.95, significance level = 0.05), who were randomly assigned into two experimental groups and one control group (15 participants per group). The research instrument was the 28-item Goldberg General Health Questionnaire (1972). The intervention protocol in both experimental groups included five training sessions per week for 30 minutes per session at 60–90% of maximum heart rate (HR) for both types of protocols. All statistical analyses were conducted using SPSS version 25, with the significance level set at $P < .05$. The findings showed that the posttest mean scores of both experimental groups differed significantly from the control group in terms of mental health ($p \leq .001$); however, there was no significant difference between the two experimental groups ($p \geq .001$). Additionally, the effect sizes of all variables in the morning exercise group were greater than those in the circuit training group. The findings indicated that both circuit training and morning exercise programs led to significant improvement in the mental health of the permanent staff of the Ground Forces; however, morning exercise demonstrated greater effectiveness. The appropriate intensity, regular structure, and higher alignment of morning exercise with the psychological and occupational needs of military personnel resulted in stronger positive effects on reducing tension, improving mood, and enhancing psychological indicators.

Keywords: mental health, circuit training, morning exercise

How to cite this article:
Ahmadi, A., Zarali, M., & Ebdalifar, A. (2026). Comparison of the Effects of Eight Weeks of Moderate-Intensity Circuit Training and Morning Exercise on the Mental Health of Permanent Staff of the Ground Forces of the Islamic Republic of Iran Army. *Mental Health and Lifestyle Journal, 4*(2), 1-12. https://doi.org/10.61838/mhlj.158

Introduction

Mental health is widely recognized today as a critical component of human well-being, organizational performance, and social stability. In the domain of military and high-demand occupations, maintaining

psychological health becomes even more essential due to continuous exposure to stressors, high levels of responsibility, and the need for sustained vigilance. According to the **Diagnostic and Statistical Manual of Mental Disorders**, mental health encompasses emotional regulation, cognitive functioning, behavioral adaptation, and the ability to manage life's challenges effectively (1). Within the armed forces—as one of the most high-pressure professional environments—mental well-being directly influences operational readiness, decision-making accuracy, social functioning, teamwork, and long-term career sustainability. Thus, identifying safe, accessible, and scientifically grounded approaches to improving mental health in military personnel has become a major research priority across sports sciences, psychology, and occupational health.

Physical activity is one of the most consistently documented protective factors for psychological well-being across populations, age groups, and occupational settings. Numerous theoretical and empirical models highlight the biological, cognitive, and psychosocial mechanisms through which exercise reduces symptoms of anxiety, depression, and stress while enhancing mood, resilience, and quality of life (2). From a developmental and public-health perspective, physical activity is described as both a preventive factor and a therapeutic tool capable of strengthening emotional stability and facilitating adaptive coping (3). Decades of systematic research have consolidated exercise as a non-pharmacological, low-cost, and sustainable strategy with proven efficacy in enhancing mental health and cognitive performance.

The positive psychological outcomes of exercise are explained by several well-validated models. Biological models emphasize exercise-induced neurochemical changes, such as the release of endorphins, regulation of monoamines, and improved neuroplasticity—mechanisms shown to enhance affective stability and reduce stress reactivity (4). Cognitive and behavioral models argue that physical activity interrupts maladaptive thought patterns, increases self-efficacy, and restores a sense of control, thereby alleviating symptoms of anxiety and depression (5). Meanwhile, psychosocial theories highlight the role of structured exercise in promoting social interaction, group cohesion, and emotional expression, which are especially important in military organizational cultures (6).

Recent studies continue to reinforce these mechanisms by demonstrating the multidimensional benefits of exercise on mental health. For instance, high-quality evidence among student populations emphasizes that structured exercise programs significantly improve psychological well-being and academic functioning (7, 8). Research among older adults similarly confirms that regular physical training strengthens social competence, reduces loneliness, and enhances resilience—factors that directly influence emotional health (9). In other contexts, exercise has been shown to improve anxiety, stress regulation, and adaptive coping through pathways mediated by psychological resilience and moderated by environmental conditions such as media exposure (10). Large-scale studies also support a dose-response relationship between physical exercise and mental health, demonstrating that both the type and intensity of exercise influence neural and genetic mechanisms underlying adolescent mental well-being (11).

Beyond general populations, several studies underscore the relevance of physical activity in sports and performance settings, highlighting cross-domain improvements in cognitive functioning, affective regulation, and motor performance. Young athletes, for example, exhibit better mental health outcomes when engaged in healthy lifestyle behaviors, regular training, and supportive environments (12). Cognitive performance and decision-making also appear to benefit from consistent aerobic or perceptual-motor training, even under conditions of stress or sleep deprivation (13-15). Similar findings extend to professional

and elite athletes, where team climate and help-seeking attitudes have been found to significantly affect mental well-being (16, 17). These insights reinforce the adaptive value of exercise as a tool not only for performance optimization but also for sustaining psychological health across diverse groups.

The workplace context also provides strong evidence supporting the mental-health benefits of exercise. Regular exercise enhances cognitive performance, workplace productivity, and executive functioning by regulating stress, improving alertness, and promoting emotional balance (18). As the nature of work environments becomes increasingly complex, physically active employees demonstrate stronger decision-making capacities, improved work engagement, and reduced mental fatigue. These findings strongly align with military demands, where precision, rapid response, and emotional self-regulation are essential for effective performance.

In military settings, routine physical training has long been considered essential to discipline, preparedness, and physical conditioning. However, its potential psychological benefits—especially regarding resilience, anxiety regulation, mood stability, and stress reduction—have received increasing scientific attention. Military personnel often face a unique combination of physical strain, psychological pressure, hazardous environments, and rigid organizational structures. These factors can lead to elevated levels of anxiety, sleep disturbances, irritability, social dysfunction, and diminished overall well-being. Thus, integrating evidence-based exercise programs into military training protocols is not only beneficial but also necessary for maintaining operational effectiveness.

Two specific forms of exercise—circuit training and morning exercise—have received notable research interest due to their practicality, accessibility, and potential psychological benefits. Circuit training, characterized by sequential performance of exercises targeting major muscle groups at moderate intensities, combines aerobic and resistance components, producing both metabolic and psychological benefits (19). Its structured nature enhances self-efficacy and creates a predictable routine that facilitates emotional regulation. Circuit training has been shown to improve cognitive inhibition, mood states, and executive functioning across different populations (15). It also helps reduce maladaptive exercise patterns, balance physical exertion, and improve behavioral health outcomes (20). Furthermore, its emphasis on progression and controlled intensity allows individuals to maintain engagement while minimizing risk of overtraining (6).

Morning exercise, in contrast, is widely implemented in military organizations and known for its energizing effect, circadian alignment, and capacity to prepare personnel physically and psychologically for the demands of the day. Morning workouts typically involve a combination of aerobic, flexibility, and body-weight resistance exercises and have been shown to improve vitality, mood, mental alertness, and psychological resilience. Research indicates that morning exercise increases cognitive efficiency and stabilizes emotional responses throughout the day (18). Furthermore, morning routines promote discipline, synchronization with biological rhythms, and improved regulation of stress hormones. These characteristics make morning exercise particularly suitable for military personnel who must maintain both physical readiness and psychological equilibrium throughout their shift cycles.

In addition, combined physiological and psychological research underscores that exercise may mitigate internalizing disorders and improve psychosocial functioning when implemented regularly. For example, structured interventions have significantly reduced symptoms of mental ill-being in children with attention-

deficit/hyperactivity disorder, mediated by improvements in resilience and emotional self-control (21). Similarly, aerobic training and supplementation strategies have demonstrated synergistic effects on metabolic and psychological outcomes in adults (22). Such findings indicate that appropriately designed exercise programs have a substantial influence on both physical and psychological health.

Given the existing research gaps, particularly in occupational and military contexts of non-Western countries, there is a growing need for controlled studies examining how different types of exercise affect mental health outcomes in military personnel. The daily responsibilities of the ground forces require continuous presence, physiological readiness, and emotional stability; thus, identifying the most effective training modality is highly valuable for policy makers, military commanders, and health specialists. Circuit training and morning exercise represent two widely used yet scientifically under-investigated training approaches in Iranian military settings, particularly regarding their direct psychological outcomes.

Despite extensive global literature, evidence comparing these two exercise modalities in a single controlled study remains limited. International datasets highlight the diverse pathways through which exercise influences mental well-being, but cultural, occupational, physiological, and environmental variables may alter these outcomes. Therefore, context-specific research is essential to determine which type of training—circuit-based or structured morning exercise—yields superior benefits for mental health among military staff. Such findings could help optimize training programs, reduce the mental-health burden, and promote long-term operational efficiency.

Therefore, the aim of this study is to compare the effect of eight weeks of moderate-intensity circuit training and morning exercise on the mental health of permanent personnel of the Ground Forces of the Islamic Republic of Iran Army.

Methods and Materials

Study Design and Participants

This study was a semi-experimental design with pretest–posttest and control and experimental groups. The statistical population consisted of all permanent staff of the Ground Forces of the Islamic Republic of Iran Army. The sample size was determined based on the study inclusion criteria and using G*Power software for three groups (experimental and control). The sample size was calculated using G*Power software (effect size = 0.45, statistical power = 0.95, and significance level = 0.05) and participants were randomly assigned into two groups, experimental and control. The inclusion criteria ensured that participants had the necessary capability and conditions to effectively participate in exercise training and respond to research instruments. These criteria included: being a permanent staff member of the Ground Forces of the Islamic Republic of Iran Army, being between 20 and 45 years of age, having appropriate physical health confirmed by a military physician, not suffering from chronic diseases or movement limitations that would prevent exercise participation, and not having a history of injury or surgery within the past six months. Additionally, written informed consent to participate in the study, absence of concurrent use of medications or therapeutic methods affecting mental health or physical fitness, and commitment to regular attendance throughout the eight-week training program were also required.

The exclusion criteria were defined to preserve participant safety and maintain the scientific validity of the data. These included developing acute or chronic illness during the study period, injury or physical

disability, and absence or withdrawal from more than 20% of training sessions. Furthermore, lack of cooperation or withdrawal of consent, use of psychotropic medications or drugs affecting physical or psychological performance, and participation in training programs or physical activities outside the study protocol that could confound the results were also considered exclusion criteria. Five instruments were used to collect information and measure variables. First, a demographic information sheet was used to record basic participant characteristics. Moreover, the 28-item Goldberg General Health Questionnaire (1972) and a medical history questionnaire were used to assess psychological and physical status. In addition, to measure physical fitness and physiological indicators, the Par-Q questionnaire, an AND digital scale (model HL400, accuracy 0.1 g), a Seca stadiometer (Germany), and a Tavan-Azma stopwatch were used. These tools enabled precise quantitative and qualitative data collection to analyze the effects of circuit training and morning exercise on the mental health and physical fitness of the staff. To collect personal and demographic data, a personal information form was designed, including age, work history, educational level, organizational position, marital status, and number of children to provide a demographic profile of the participants.

Data Collection

The 28-item Goldberg General Health Questionnaire (GHQ-28) is one of the most well-known screening tools for non-clinical psychological disorders. It was first developed by Goldberg in 1972 and later reduced to the 28-item form through factor analysis by Goldberg and Hiller (1979). This questionnaire is based on the self-report method and assesses the individual's psychological status during the past month. Compared to the original 60-item version, GHQ-28 is more structured and practical, and it is widely used in general, organizational, occupational, and military environments. The tool includes four subscales: "somatic symptoms," "anxiety and insomnia," "social dysfunction," and "depression," each consisting of seven items assessing different aspects of mental health. The validity and reliability of GHQ-28 have been widely confirmed internationally, and the questionnaire has been translated into more than 38 languages and used in over 70 countries. Domestic research findings have also shown appropriate validity for this tool. For example, Yaghoubi et al. (1995) in Iran reported a cut-off score of 23 as having the best sensitivity. Furthermore, Bahmani and Asgari (2006) reported satisfactory construct validity (approximately 69%) and a strong negative correlation with psychological well-being. The reliability of the instrument has been reported with Cronbach's alpha coefficients ranging from 0.71 to 0.88 for subscales and 0.90 for the total scale, indicating high internal consistency and acceptable reliability of GHQ-28 for assessing mental health.

Interventions

Moderate-Intensity Circuit Training Protocol

The main training protocol consisted of five sessions per week lasting 30 to 45 minutes each, performed at 60–90% of maximum heart rate (HR). The training program included a circuit training routine using body weight, consisting of six different exercises (Table 1). Each exercise was performed for one minute with 60 seconds of rest between sets, and each training session lasted approximately 30 to 35 minutes.

The main exercise circuit included the following movements: butt kicks in place, plank jacks, skater jumps, oblique woodchop, running, rotational woodchop, power jumps, squats, plank (exercises for weeks one and

seven), medicine-ball halo rotations, single-leg lateral hops, lateral mountain climbers, swings, lunges, and plank (exercises for weeks two and eight), alternating zigzag jumps, narrow-to-wide squats, mountain climbers, wall sit, and plank (exercises for week three), jumping jacks, forward–backward jumps, punching, overhead medicine-ball press, wall sit, and plank (week four), high-knees running, mountain climbers, box jump squats, striking drills, and plank (week five), squats, lunges, lateral mountain climbers, jumping jacks, lateral striking drills, and plank (week six). These exercises were performed by participants (Seo et al., 2019). In addition, videos, photos, and educational brochures were provided to ensure proper execution of each exercise. It is noteworthy that before starting the training protocol, two orientation sessions were held to familiarize participants with the exercises and the use of required tools (especially the Polar heart rate monitor model 400M, Finland), ensuring proper execution and intensity control during training sessions.

Table 1. Moderate-Intensity Circuit Training Protocol (Weeks 1–8)

Week(s)	Weekly Sessions (n)	Sets per Session (n)	Exercises per Set (n)	Duration per Exercise (s)	Intensity (%HRR)	Duration per Set (min)	Rest Between Sets (min)	Warm-up & Cool-down (min)	Total Training Duration (min)
Weeks 1–2	5	2	6	60	60–90	10	1	10	30–45
Weeks 3–4	5	2	6	60	60–90	10	1	10	30–45
Weeks 5–6	5	2	6	60	60–90	10	1	10	30–45
Weeks 7–8	5	2	6	60	60–90	10	1	10	30–45

Morning Exercise Protocol

Morning exercise among military personnel is designed to enhance overall physical fitness, improve endurance, strength, flexibility, and agility. This program is conducted daily between 6:00 and 7:00 a.m. for 30 to 45 minutes, and continues at least five days per week to create a significant impact on physical health and operational readiness. Morning exercise is structured to include both aerobic and resistance activities, as well as agility and flexibility drills; therefore, it serves as a comprehensive program to improve the physical performance of military staff.

The exercises include three main stages. The warm-up stage consists of 8–10 minutes of light jogging or brisk walking and dynamic stretching movements targeting major joints and muscles, such as arm circles, forward bends, trunk rotations, and lunges. In the main training stage, moderate-intensity running is performed for 10–15 minutes, followed by resistance exercises including push-ups, squats, sit-ups, and lunges with specified sets and repetitions. Additionally, agility and flexibility exercises, such as change-of-direction running and static stretching movements, are included. Finally, the cool-down stage lasts 5–10 minutes and includes light walking and static stretching to reduce muscle tension.

Data analysis

After confirming the normal distribution of weight data using the Kolmogorov–Smirnov test, Levene's test was used to assess homogeneity of variances. Analysis of covariance was then used to examine between-group differences in quantitative data. All statistical analyses were performed using SPSS version 25 with a significance level of $P < .05$.

Findings and Results

As shown in Table 2, after controlling for the effect of the pretest, the differences in pretest–posttest scores among the three groups for the mental health variable were significant ($p < .001$).

Table 2. Results of Analysis of Covariance for the Experimental and Control Groups on the Mental Health Variable

Source of Variation	SS	df	MS	F	p-value	Effect Size
Group	1830.924	2	915.462	194.894	< .001	.90
Error	192.587	41	4.697			
Total	867,927	45				

The preliminary assumptions for all variables were examined prior to selecting the appropriate statistical tests and testing the hypotheses. The data in this study were interval-scaled. To evaluate the assumptions of normality and homogeneity of variances, the Shapiro–Wilk test and Levene's test were applied. The Shapiro–Wilk results indicated non-significant values for all variables ($P > .01$), demonstrating that the distribution of all research variables was normal. Levene's results showed that the variances of mental health and social functioning were homogeneous across the groups ($P > .05$), while the variables of depression, anxiety and insomnia, and somatic symptoms violated this assumption, as their variances were not equal across groups. Considering that the sample size was equal in all groups, the subsequent assumptions were further examined to determine the appropriate analytical approach for these variables.

To examine pairwise differences, the Bonferroni post-hoc test was used, and the results are reported in Table 3.

Table 3. Pairwise Comparison of Mental Health Scores Among the Three Groups

i	j	Mean Difference (i-j)	p
Morning Exercise	Circuit Training	−0.0758	.001
	Control	−13.5801	< .001
Circuit Training	Control	−13.5043	< .001

As shown in Table 3, the permanent staff of the Ground Forces of the Islamic Republic of Iran Army who received morning exercise reported better mental health compared to those who received circuit training ($p < .001$). Additionally, the permanent staff who received either the morning exercise intervention or the circuit training intervention reported better mental health compared to the control group ($p < .001$). This indicates that morning exercise had greater effectiveness than circuit training in improving the mental health of the permanent staff of the Ground Forces of the Islamic Republic of Iran Army. Therefore, it can be concluded that there is a difference in effectiveness between morning exercise and circuit training in enhancing mental health among the permanent staff of the Ground Forces of the Islamic Republic of Iran Army. Accordingly, the first hypothesis is confirmed.

Discussion and Conclusion

The findings of the present study demonstrated that both moderate-intensity circuit training and structured morning exercise significantly improved the mental health of permanent staff in the Ground Forces, although morning exercise produced a stronger effect. This pattern of results aligns with a broad

body of evidence indicating that structured physical activity—regardless of modality—exerts robust benefits on psychological well-being across various populations. The significant pretest–posttest improvements across all mental health subscales reflect established theoretical frameworks emphasizing that exercise stimulates neurobiological, psychological, and behavioral mechanisms responsible for improved emotional regulation, reduced psychological distress, and enhanced cognitive functioning (2, 4). According to neurobiological perspectives, regular physical exercise improves neurotransmitter balance, reduces cortisol levels, and increases endorphin secretion, all of which reduce anxiety and depressive symptoms and enhance overall emotional stability. These explanations are consistent with the statistically significant reductions observed in somatic complaints, anxiety and insomnia, social dysfunction, and depression following both training interventions.

The stronger effects of morning exercise compared with circuit training suggest that the timing, structure, and holistic nature of morning workouts may offer psychological advantages beyond those associated with circuit training alone. Morning exercise protocols typically involve a combination of aerobic, flexibility, and resistance activities performed in a rhythmic, low-stress manner that aligns with circadian physiology. This combination is known to promote heightened alertness, improved metabolic efficiency, and improved endocrine functioning throughout the day, which directly contributes to greater emotional stability and reduced perceived stress (18). Research among workplace populations shows that employees who engage in morning exercise experience greater daily productivity, improved cognitive functioning, and enhanced mood regulation across their workday (18). These findings resonate with the improvements observed in the military personnel participating in morning exercise in this study.

The results also parallel research conducted with older adults, adolescents, and specialized populations, where structured exercise significantly predicts improvements in emotional resilience and reductions in psychological vulnerability. For example, evidence shows that physical training can enhance resilience and reduce mental ill-being in children with ADHD (21), improve quality of life and memory in older adults (14), and positively influence mental health among student athletes (8). Similarly, exercise programs have been found to enhance cognitive inhibition control in children with coordination disorders (15), emphasizing the cross-population efficacy of exercise in enhancing psychological and cognitive functioning. These converging findings reinforce the notion that structured movement, regardless of modality, has strong regulatory effects on psychological functioning—an observation consistent with the mental-health improvements documented in our study.

The greater effectiveness of morning exercise may also relate to its habitual, daily structure. Habitual physical activity provides structured opportunities for social interaction, emotional expression, and behavioral regulation. Research suggests that social and lifestyle factors often influence mental health outcomes more strongly than isolated aspects of training design (12). Morning exercise, because of its routine and collective nature, may foster a stronger sense of belonging, discipline, and emotional synchronization within military groups. Such collective experiences in physically engaging environments have been associated with increased social cohesion, positive affect, and improved psychological outcomes (16). This dynamic may explain why morning exercise produced more substantial improvements in social functioning and overall psychological well-being.

Additionally, work examining dose–response relationships between physical activity and mental health suggests that exercise performed at moderate intensity with consistent timing generates strong neural and genetic benefits that impact core domains of emotional regulation (11). Morning exercise—carried out at a consistent circadian time point—may activate these biological pathways more effectively than afternoon or irregular exercise schedules typical of circuit training programs. The observed results are therefore consistent with the hypothesis that chronobiological alignment plays a meaningful role in mediating psychological benefits.

The results also align with studies demonstrating that low- to moderate-intensity aerobic activities improve cognitive performance, alertness, and decision-making in athletes and physically active adults (13). Military personnel, who perform complex decision-making tasks in high-stress environments, are likely to benefit particularly from such enhancements. Similarly, research indicates that physical exercise reduces maladaptive patterns such as dysfunctional eating and excessive technology use—behaviors strongly linked to emotional distress—by strengthening self-regulation and executive functioning (20). Such mechanisms may contribute to the improved mental health outcomes observed in both experimental groups.

Meanwhile, the positive effects of circuit training are also strongly supported by previous research. Circuit training, as a hybrid form of aerobic and resistance exercise, increases heart rate variability, cardiorespiratory endurance, neuromuscular strength, and metabolic efficiency, all of which are associated with improved mental health outcomes (6). Studies conducted with adult and adolescent populations show that circuit training regulates anxiety, decreases stress, and enhances subjective well-being through improved self-efficacy and reductions in physical tension (23). Additionally, review studies confirm strong associations between physical activity and improved mental health across children, adolescents, and adults, highlighting its broad therapeutic value (3). Thus, the significant improvements observed in the circuit-training group mirror robust prior findings from both sports and mental-health literature.

The results further align with research in performance-oriented environments showing that individuals with active lifestyles exhibit greater mental stability and more favorable emotional profiles than those with sedentary routines (2). Military environments—because of their inherent stress, unpredictability, and physically demanding structure—can amplify the benefits of regular exercise on psychological functioning. The improvements documented in the present study therefore represent expected patterns within theoretical frameworks linking physical activity to improved mood states, decreased psychological distress, and stronger cognitive performance (4). The dual nature of exercise-related adaptations—both physiological and psychosocial—supports the strong improvements observed in both experimental conditions.

Another reason for the superiority of morning exercise may involve its multimodal structure. Research shows that combining aerobic and resistance components results in stronger mood-related outcomes compared to performing either independently (19). Circuit training also uses both components; however, its intensity progression and anaerobic load may create slightly higher acute stress in some individuals. Evidence from experimental psychology indicates that moderate-intensity activity—performed rhythmically and aerobically—produces the most consistent improvements in affective states (4). Thus, morning exercise may better approximate the optimal intensity range for emotional well-being in military personnel.

Another important point involves sociocultural and occupational context. Military personnel often operate under highly structured schedules, and morning exercise programs are traditionally integrated into

their daily routines. Because of this structural fit, morning training may reduce psychological resistance, provide a sense of predictability, and align more naturally with military culture. Previous research in organizational and athletic contexts suggests that alignment between training design and cultural expectations significantly enhances psychological outcomes (17). Circuit training, despite its benefits, may represent a less familiar format for some personnel, reducing its comparative psychological impact.

Finally, robust findings across multiple domains emphasize that physical activity reduces psychological distress through resilience-building pathways. Research has shown that exercise enhances emotional resilience in children with ADHD (21), supports older adults by improving social competence and reducing loneliness (9), and decreases anxiety in older adults via resilience mechanisms (10). These outcomes parallel the current study's findings, suggesting that both morning exercise and circuit training operate through similar resilience-enhancing pathways, but the former may be more potent due to its timing, structure, and psychosocial environment.

In summary, the results of the present study are strongly supported by prior research and theoretical models across psychology, exercise science, and military performance domains. Morning exercise appears to yield more pronounced effects on mental health than circuit training, likely due to its circadian alignment, habitual structure, combined modality, psychosocial context, and suitability to military organizational culture. Both training methods, however, demonstrate significant therapeutic potential.

This study was limited by its relatively small sample size, which may reduce generalizability. The research was conducted within a single military training center, limiting external validity to other branches of the armed forces or civilian occupations. The study duration was eight weeks, preventing long-term assessment of training effects. Self-report instruments, despite their validity, may be influenced by social desirability or military cultural expectations. Moreover, environmental factors such as sleep quality, nutrition, workload, and stress exposure were not controlled and may have influenced mental-health outcomes. The study also did not examine potential mediators such as resilience, self-efficacy, or stress hormones, which could clarify underlying mechanisms.

Future research should employ larger and more diverse samples across different military units and cultural contexts. Longitudinal studies could evaluate whether improvements persist beyond the intervention period. Comparative studies examining different intensities, durations, and combinations of exercise modalities could further clarify optimal programming for mental health. Investigating mediating variables such as resilience, cortisol levels, sleep quality, and social cohesion would deepen understanding of underlying mechanisms. Including qualitative interviews or mixed-methods approaches could capture subjective experiences of participants, offering richer insights into psychological changes.

Military organizations should integrate structured morning exercise as a core component of daily routines to support psychological readiness. Circuit training can also be used as an effective complementary method, particularly for improving specific fitness domains. Commanders and health officers should ensure consistent participation, appropriate intensity monitoring, and supportive group environments. Incorporating psychological skills training, relaxation techniques, and resilience-building components into physical training schedules may further enhance benefits. Regular mental-health screenings should accompany training programs to ensure safety and maximize effectiveness.

Acknowledgments

The authors express their deep gratitude to all participants who contributed to this study.

Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

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