

The Impact of Long-Distance Running Exercise on Body Composition and Psychological Stress

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Abstract. This study aimed to examine the effects of structured long-distance running training monitored by wearable fitness trackers on body weight, body mass index (BMI), and perceived stress levels among overweight young adults. A quasi-experimental design with a pretest–posttest control group was employed involving 20 participants aged 20–25 years who were classified as overweight or mildly obese. Participants were divided into an experimental group (n = 10) and a control group (n = 10) with homogeneous baseline characteristics. The experimental group participated in a structured long-distance running program for 4–9 weeks, three times per week, at moderate intensity (60–70% HRmax), while the control group received only general health education. Body weight, BMI, and perceived stress (measured using the Perceived Stress Scale/PSS) were assessed before and after the intervention. The results showed significant reductions in body weight and BMI in the experimental group ($p < 0.05$), while no significant changes were found in the control group. Perceived stress scores also decreased significantly in the experimental group ($p < 0.05$). Pearson correlation and linear regression analyses revealed that training duration and frequency were significantly associated with improvements in BMI and stress levels. These findings indicate that structured long-distance running monitored with wearable technology is an effective non-pharmacological intervention for improving physical and psychological health among overweight young adults, particularly those exposed to sedentary lifestyles and elevated stress levels

Keywords: long distance running athletics; obesity; stress reduction; BMI; health



INTRODUCTION

Athletics is a sport with numerous benefits for physical and mental health. One of the most popular events in athletics is long-distance running. Long-distance running, also known as marathon running, is a running sport that involves running over a wide, long track (Sari and Suropto 2021), usually 3000m, 5000m, 10,000m, and above (Juniarti, Pranansa, and Syafutra 2022). Long-distance running is not only a competitive event for professional athletes, but also a healthy lifestyle for the general public. Fun runs have become a popular lifestyle in Indonesia. Their popularity offers new hope for life in the modern era of minimal physical activity. This activity plays a vital role in improving physical fitness, helping with weight management, and reducing stress levels (Kutac et al. 2023). With obesity cases rising in both developed and developing countries, exercise is becoming an effective solution for natural weight control.

Obesity is characterized by excess body fat and is associated with a lack of physical activity, which also compromises health and increases the risk of death (Lundgren et al. 2021). One of the main benefits of running is that it helps you lose weight (Williams 2013). In addition to improving cardiovascular fitness, running also involves weight loss in the subject (Chee et al. 2021). Long distance running is an aerobic activity that can burn large amounts of calories, increase metabolism, strengthen bones (Lee 2019) and improve body composition by reducing fat and increasing muscle mass (Chee et al. 2021). Studies show that aerobic exercise such as long-distance running can help reduce the risk of non-communicable diseases such as type 2 diabetes, hypertension, and heart disease, which are often associated with excess weight and a sedentary lifestyle (Pytko et al. 2023).

Running not only improves physical fitness, but also has benefits in reducing stress, improving mood, and building mental resilience (Mulyana et al. 2024). Evidence supports the positive effects of varying durations and intensities of running on mental health (Oswald et al. 2020). Long distance running also has an important role in maintaining mental health and reducing stress (Mulyana et al. 2024). In the modern era, stress has become a common health problem due to work pressure, social pressure, and other factors. Long-distance running can be a natural way to deal with stress because it stimulates the release of endorphins, known as the happiness hormone (Lukács et al. 2019). Endorphins help improve mood, reduce anxiety, and may even prevent depression.

Furthermore, running provides an opportunity for individuals to interact with their environment, boost self-confidence, and build mental resilience.

Long-distance running can be part of a global strategy to improve health and well-being. Governments and various global health organizations continue to encourage people to be more active in sports to prevent the rise in non-communicable diseases. However, although long-distance running offers numerous benefits, challenges remain in its implementation. Lack of awareness of the importance of exercise, limited supporting facilities, and a lack of education on proper running techniques often hinder the optimal use of this sport. Therefore, various efforts are needed to encourage more individuals to adopt long-distance running as part of a healthy lifestyle. Educational programs, the provision of better sports facilities, and the promotion of the benefits of running for physical and mental health can be strategic steps in achieving SDG 3. By increasing public awareness of the importance of exercise, it is hoped that obesity rates and mental health disorders will decrease, leading to a healthier and more prosperous society.

However, despite extensive research into the benefits of long-distance running, challenges remain in increasing community participation in this sport. Lack of awareness, motivation, and inactivity are key barriers to adopting long-distance running as a strategy for weight loss and stress management. Therefore, further research is needed to understand the effectiveness of long-distance running in promoting weight loss and stress management, and how it can be integrated into sustainable public and school health programs. Therefore, this study aims to analyze the role of long-distance running in weight loss, stress reduction, and supporting the achievement of SDG 3 through a sustainable and evidence-based approach.

METHOD

This study employed a quasi-experimental design using a pretest–posttest control group approach to examine the effects of structured long-distance running training on body weight, body mass index (BMI), and perceived stress levels among overweight young adults. A total of 20 participants aged 20–25 years were recruited and classified as overweight or mildly obese based on baseline BMI values. Participants were divided into an experimental group ($n = 10$) and a control group ($n = 10$), with both groups showing homogeneous characteristics in terms of age, sex, and baseline health status. Inclusion criteria included having a $BMI \geq 25 \text{ kg/m}^2$, not participating in any structured exercise

program for at least three months prior to the study, and being free from musculoskeletal injuries and cardiovascular disorders. All participants provided written informed consent prior to participation.

The experimental group participated in a structured long-distance running program conducted over 4–9 weeks, with three training sessions per week. Each training session consisted of a 5–10-minute warm-up, followed by 25–40 minutes of long-distance running at a moderate intensity of 60–70% of maximum heart rate (HRmax), and ended with a 5–10-minute cool-down. Exercise intensity, running duration, and distance were continuously monitored using wearable fitness trackers to ensure adherence and consistency of the training load. The control group did not receive any specific exercise intervention and only received general education regarding healthy lifestyle practices.

Body weight was measured using a digital scale with 0.1 kg precision, while BMI was calculated as body weight in kilograms divided by height in meters squared. Perceived stress levels were assessed using the Perceived Stress Scale (PSS-10), a validated instrument for measuring psychological stress in adults. All measurements were conducted at baseline and after the completion of the intervention. Data were analyzed using SPSS software, and descriptive statistics were presented as mean and standard deviation. Paired sample t-tests were used to examine within-group differences, independent sample t-tests were applied to compare changes between groups, Pearson correlation analysis was conducted to determine relationships between training variables and outcome measures, and linear regression analysis was used to identify predictors of changes in BMI and stress levels. Statistical significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

This study involved 20 adult participants (aged 20–25 years) divided into two groups: an experimental group ($n = 10$) and a control group ($n = 10$). Both groups were homogeneous in terms of age, gender, and baseline health status. All participants were categorized as overweight or mildly obese based on their baseline Body Mass Index (BMI). The experimental group underwent a 4–9-week long-distance running program at moderate intensity (60–70% HRmax) using a wearable fitness tracker to monitor running duration and distance. The control group received no specific intervention and only general education about a healthy lifestyle. Based on the results of a paired t-test, there

was a significant decrease in body weight and BMI in the experimental group compared to the control group.:

Table 1. Results of Research Statistical Tests

Variable	Group	Pre-Test (Mean ± SD)	Post-Test (Mean ± SD)	p-value
Body Weight (kg)	experiment	78.3 ± 6.2	74.5 ± 5.8	0.000**
Body Weight (kg)	control	77.9 ± 5.7	77.5 ± 5.9	0.245
IMT (kg/m ²)	experiment	28.1 ± 2.3	26.7 ± 2.0	0.000**
IMT (kg/m ²)	control	27.9 ± 2.1	27.8 ± 2.0	0.389

Note: $p < 0.05$ indicates statistically significant results.

There was a significant decrease in stress scores in the experimental group:

Table 2. Correlation Analysis

Variable	Group	Pre-Test (Mean ± SD)	Post-Test (Mean ± SD)	p-value
Perceived Stress Scale	experiment	23.6 ± 3.8	17.2 ± 3.1	0.000**
	control	22.9 ± 4.0	21.8 ± 3.9	0.102

Pearson correlation analysis showed a significant relationship between: Weight loss and decreased stress scores ($r = 0.61$, $p < 0.01$). Total running duration (weeks × sessions) with changes in BMI ($r = -0.72$, $p < 0.01$). Weekly running frequency with decreased PSS scores ($r = -0.53$, $p < 0.05$). Linear regression showed that training duration (in weeks) significantly predicted changes in BMI scores ($R^2 = 0.54$, $p = 0.000$), and was a significant predictor of changes in stress levels ($R^2 = 0.38$, $p = 0.002$). The results showed that a structured long-distance running training program for 4–9 weeks significantly reduced body weight, body mass index (BMI), and stress levels in the experimental group. These findings are in line with previous studies that suggest that aerobic activities such as running can improve body composition and reduce psychological stress levels through increased endorphins and regulation of stress hormones (Hillman et al., 2008; Dishman et al., 2006).

DISCUSSION

The present study demonstrated that a structured long-distance running program conducted over 4–9 weeks and monitored using wearable fitness trackers significantly

reduced body weight, body mass index (BMI), and perceived stress levels among overweight and mildly obese young adults. The experimental group showed statistically significant improvements in all measured outcomes compared to the control group, indicating that long-distance running serves as an effective aerobic intervention for both physical and psychological health enhancement.

The significant reductions in body weight and BMI observed exclusively in the experimental group support the role of long-distance running in improving energy balance and body composition. These findings are consistent with previous studies reporting that regular aerobic running promotes fat oxidation and caloric expenditure, leading to meaningful weight loss and BMI improvement (Chee et al., 2021; Kutac et al., 2023). The use of wearable fitness trackers in this study likely enhanced participants' adherence to training targets and enabled real-time monitoring of exercise intensity and duration, thereby optimizing training load and accountability, as also emphasized by Cadmus-Bertram et al. (2015).

Beyond physiological benefits, the marked reduction in perceived stress scores among the experimental group confirms the psychological benefits of running. This finding aligns with Oswald et al. (2020) and Kruisdijk et al. (2019), who reported that running participation and running-based therapy significantly reduce stress and depressive symptoms. The stress-reducing effect of running may be attributed to neurobiological mechanisms such as increased endorphin secretion, improved serotonin regulation, and decreased cortisol levels, as well as the meditative and rhythmic nature of running, which facilitates emotional regulation and mental relaxation (Brosse et al., 2002; Hillman et al., 2008).

The significant correlations between training variables and health outcomes further strengthen the causal interpretation of these findings. The strong negative correlation between total training duration and changes in BMI ($r = -0.72$) suggests that cumulative training volume plays a crucial role in improving body composition. Similarly, the inverse relationship between weekly running frequency and reductions in perceived stress ($r = -0.53$) indicates that consistent engagement in running is essential for achieving psychological benefits. These findings are further supported by regression analyses showing that training duration significantly predicted both BMI reduction and

stress improvement, highlighting the importance of sustained participation in aerobic exercise programs.

Collectively, these results indicate that long-distance running is not merely an effective strategy for weight management but also a powerful non-pharmacological intervention for stress reduction. This dual benefit makes long-distance running particularly relevant for urban young adults who are increasingly exposed to sedentary lifestyles and chronic psychological stress. However, several limitations should be acknowledged. The relatively small sample size, short intervention duration, and reliance on self-reported stress measures may limit the generalizability of the findings. Future studies should employ larger and more diverse samples, longer intervention periods, and objective stress biomarkers (e.g., salivary cortisol, heart rate variability) to strengthen causal inferences and broaden applicability.

CONCLUSION

This study concludes that structured long-distance running training monitored using wearable fitness trackers is an effective intervention for improving both physical and psychological health outcomes among overweight individuals. The findings demonstrate that the training program significantly reduced body weight and body mass index (BMI), indicating its effectiveness in promoting weight loss and improving body composition. In addition, the results revealed a significant reduction in perceived stress levels, as measured by the Perceived Stress Scale (PSS), highlighting the beneficial role of long-distance running in enhancing psychological well-being. Furthermore, the analysis showed a positive correlation between training intensity and consistency with both physiological and psychological improvements, suggesting that regular and appropriately dosed exercise leads to greater health benefits. Therefore, long-distance running can be considered not only a practical and accessible strategy to improve physical fitness but also a non-pharmacological approach to stress management. This makes it particularly relevant as a preventive and promotive health intervention for urban populations that are highly vulnerable to sedentary lifestyles and chronic stress.

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