

The Effect of Walking Exercise on Body Mass Index among Overweight and Obese Employees at Nusa Cendana University

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Abstract: *Obesity is a condition characterized by an imbalance between energy intake and energy expenditure over an extended period. Obesity and overweight are generally caused by unhealthy lifestyles, high sugar and fat dietary patterns, and lack of physical activity. Insufficient exercise is directly associated with an increase in Body Mass Index (BMI), a condition commonly found among employees and lecturers within university environments. A preliminary survey conducted by the Health Promoting University (HPU) reported that 58.5% of respondents at Nusa Cendana University do not engage in regular exercise, while data from the 2018 Basic Health Research (Riskesdas) showed that 13.6% of Indonesians over the age of 18 are obese. One effective management strategy for overweight and obesity is walking exercise, which can increase basal metabolic rate through ATP combustion, lipogenesis, and muscle mass enhancement, leading to higher heat production and resulting in weight reduction. This study aimed to examine the effect of walking exercise on BMI among overweight and obese employees at Nusa Cendana University. A quasi-experimental method with a nonequivalent control group design was applied, involving 20 participants in the intervention group and 20 in the control group. The results showed a significant change in BMI in the intervention group ($p = 0.034$) based on a paired sample t -test. It is concluded that walking exercise has a significant effect on reducing BMI among overweight and obese employees at Nusa Cendana*

Introduction

The rapid development of the world has brought significant advancement across various sectors, including education, technology, and transportation. These advancements have driven changes in community behavior toward more passive activities and fast-paced, instant consumption patterns (Afliansa & Febriana, 2024; Fitri et al., 2024). Such lifestyle changes have resulted in reduced physical activity, which is positively associated with an increase in Body Mass Index (BMI), a method used to screen body composition through the comparison of body weight and height (Motevalli, 2025). This condition has become one of the major contributors to the rising prevalence of overweight and obesity in many countries (Amir, 2025; Liao et al., 2025).

The increasing prevalence of overweight and obesity is a global issue occurring in both developed and developing countries. According to the World Health Organization (2018),

the highest prevalence of overweight is found in the Americas and the lowest in Southeast Asia. In Indonesia, the 2018 Basic Health Research (Riskesdas) reported that the prevalence of overweight among individuals aged ≥ 18 years increased from 8.6% in 2007 to 11.5% in 2013, and rose to 13.6% in 2018, while the prevalence of obesity increased from 10.5% in 2007 to 21.8% in 2018. At the regional level, the prevalence of overweight in East Nusa Tenggara Province reached 6.7% and obesity 6.2%, with the highest rates found in Kupang City: 10% overweight and 12.1% obesity.

The issue of obesity is also found among employees at Nusa Cendana University. A preliminary survey by the Health Promoting University (HPU) in 2021 reported that of 68 employees undergoing medical check-ups, 45 were classified as overweight or obese, and 58.5% did not engage in regular exercise. Most respondents (29.3%) stated that they never exercised or exercised for less than 10 minutes per day. These data indicate that low levels of physical activity constitute a major contributing factor to increased BMI within the campus environment (Harun & Hadi, 2021; Prasasti & Wardiansah, 2023).

A number of previous studies support the important role of physical activity in reducing obesity. Hemmingsson (2006) stated that physical activity is closely associated with reductions in BMI and obesity status. Sukianto et al. (2020) found a significant relationship between physical activity and nutritional status among university employees. Studies by Fitriyani (2017), Kreuser et al. (2013), and Kurdanti et al. (2015) also demonstrated that low levels of physical activity are dominant risk factors for obesity across various age groups. In terms of intervention, Suryani Widiyanti et al. (2020) confirmed that walking exercise significantly reduces BMI, while Ram et al. (2020) and Castro et al. (2020) showed that structured physical training improves body composition in overweight and obese individuals.

The high prevalence of overweight and obesity among employees at Nusa Cendana University, combined with low physical activity levels, indicates an urgent need for simple and accessible interventions such as walking exercise to reduce the risk of degenerative diseases and improve employees' quality of life. The novelty of this study lies in its focus on structured walking exercise intervention among university employees, a population group that has received limited research attention. Therefore, this study aims to analyze the effect of walking exercise on Body Mass Index among overweight and obese employees at Nusa Cendana University.

Methodology

This study employed a quasi-experimental research method with a nonequivalent control group design, involving two groups: an intervention group and a control group. Both groups underwent an initial measurement of Body Mass Index (BMI) as a pretest, after which the intervention group received treatment in the form of walking exercise, while the control group did not receive any treatment. Following a four-week intervention period, BMI measurements were conducted again as a posttest to determine the changes in BMI and compare the results between the two groups. The study was conducted at the Faculty of Medicine and Veterinary Medicine, Nusa Cendana University, Kupang, from May to September 2022.

The population in this study consisted of employees at the Faculty of Medicine and Veterinary Medicine, the Faculty of Public Health, and the Faculty of Teacher Training and Education at Nusa Cendana University. The sample was selected using purposive sampling, based on specific inclusion and exclusion criteria. Sample size calculation was performed using the hypothesis-testing formula for paired population means according to Kreuser et al. (2013), resulting in a minimum sample requirement of 18 participants. To anticipate dropout of approximately 10%, the total sample size was increased to 40 participants, comprising 20 participants in the intervention group and 20 in the control group. Inclusion criteria included employees with BMI > 23 kg/m², aged under 60 years, able to walk independently, not undergoing a diet program, not routinely performing walking exercise (<3 times per week), and owning a smartphone capable of running the Pacer Pedometer & Step Tracker app. Participants who failed to complete at least 75% of the walking sessions were considered dropouts.

The research procedure began with screening, BMI measurement, and informed consent completion, followed by the assignment of participants into two groups. The intervention group engaged in a walking exercise program for 30 minutes, three times per week for four weeks, while the control group continued their usual activities. The walking sessions were monitored using the Pacer Pedometer app, which recorded the number of steps, duration, walking speed, and route, and participants submitted their walking reports through a WhatsApp group. Data analysis was carried out using SPSS version 21. Normality testing was performed using the Shapiro–Wilk test, while BMI changes before and after treatment within each group were analyzed using the Paired Sample T-Test or Wilcoxon Signed Rank Test, depending on data distribution. Differences in BMI changes between the intervention and control groups were analyzed using the Independent T-Test or Mann-Whitney Test.

Result and Discussion

This study was conducted within the Faculty of Medicine and Veterinary Medicine at Nusa Cendana University to examine the effect of walking exercise on Body Mass Index (BMI) among employees who are overweight and obese. Screening for potential participants was carried out from May to July 2022, resulting in 40 eligible respondents based on inclusion and exclusion criteria, who were then assigned into an intervention group (n=20) and a control group (n=20). The intervention group participated in a structured walking program for four weeks, three times per week for 30 minutes, monitored using the Pacer Pedometer application, while the control group did not receive any intervention. BMI measurements were conducted before and after the intervention. The results indicated a significant decrease in BMI in the intervention group, whereas the control group showed no meaningful change. Baseline characteristics from the initial screening of 202 employees revealed that 34% were classified as overweight and 30% as obese, with 33% reporting no physical activity, indicating the strong urgency for implementing physical activity interventions such as walking exercise within the campus environment.

Univariate Analysis

Univariate analysis was conducted to describe the characteristics of respondents based on gender, age, occupation, nutritional status, and exercise habits. Data in Table 4.1 show that a total of 202 employees were screened at the beginning of the study, consisting of 119 males (58%) and 83 females (42%). Based on age distribution, 93 respondents (46%) were categorized as young adults (< 40 years), while 109 respondents (54%) were middle-aged adults (> 40 years). Nutritional status indicated that 32 respondents (15%) were underweight, 43 respondents (21%) had normal weight, 69 respondents (34%) were overweight, and 58 respondents (30%) were obese. Exercise habits showed that 68 respondents (33%) did not exercise at all, 83 respondents (41%) exercised less than twice a week, and only 51 respondents (26%) exercised more than twice a week. These results demonstrate that the majority of employees had low levels of physical activity and a tendency toward overweight and obesity.

Table 1. Baseline Characteristics of Respondents (n = 202)

Variable	Frequency (n)	Percentage (%)
Gender		
Male	119	58
Female	83	42
Age		
< 40 years	93	46
≥ 40 years	109	54
Occupation		
Academic Staff	27	15
Administrative Staff	73	85
BMI Classification		
Underweight (17–18.4 kg/m ²)	32	15
Normal (18.5–24.9 kg/m ²)	43	21
Overweight (25–29.9 kg/m ²)	69	34
Obesity (≥ 30 kg/m ²)	58	30
Exercise Habits/Week		
No Exercise	68	33
< 2 times per week	83	41
≥ 2 times per week	51	26

Bivariate Analysis

Body Mass Index of the Intervention Group

Table 2. BMI of the Intervention Group

Variable	Pretest Mean	Posttest Mean	Mean Difference	p-value
BMI	29.170	28.995	0.175	0.034

Table 2 shows a significant decrease in the BMI of the intervention group after participating in a structured walking exercise program for four weeks. The paired sample t-test demonstrated a p-value of 0,034 ($p < 0.05$), indicating that the walking intervention effectively reduced BMI.

Body Mass Index of the Control Group

Table 3. BMI of the Control Group

Variable	Pretest Mean	Posttest Mean	Mean Difference	p-value
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BMI	30.2085	30.397	0.188	0.135
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Table 3 shows no significant difference between pretest and posttest BMI values in the control group, with a p-value of 0.135 ($p > 0.05$), indicating no meaningful change in BMI without intervention.

Comparison Between Intervention and Control Groups

Table 4. BMI Difference Between Intervention and Control Groups

Variable	Intervention (Difference)	Control (Difference)	p-value
BMI	0.175	0.188	0.01

The independent t-test analysis showed a significant difference in BMI changes between the intervention and control groups, with a p-value of 0.01 ($p < 0.05$), reinforcing that walking exercise contributed to a significant reduction in BMI.

Discussion

The results of this study indicate that the intervention group experienced a significant change in the mean Body Mass Index (BMI) before and after receiving a moderate-intensity walking exercise intervention for 30 minutes, three times per week over four weeks ($p = 0.034$). This finding is consistent with the study by Suryani Widiyanti et al. (2020), which reported that walking exercise significantly reduced BMI among adolescents in Grobogan Regency. Their study demonstrated a significant decrease in BMI in the experimental group after participating in a structured walking activity. The results are also supported by research conducted by Suryana & Fitri (2017), who found a significant relationship between physical activity, BMI, and body fat composition ($p < 0.05$), showing that individuals with normal BMI tended to perform moderate physical activity, while overweight participants tended to engage in low levels of physical activity. Similar findings were reported by Nurcahyo (2011), who concluded that physical activity provides substantial benefits in preventing obesity, indicating that better levels of physical activity correlate with healthier BMI values. Fitri et al. (2016) also stated that regular and appropriate physical activity positively affects body composition, enhances fitness, and increases productivity. This is in line with studies by Anggraini (2014) and Sorongan (2012), which demonstrated a significant association between physical activity levels and nutritional status among children and adolescents.

In contrast, the control group demonstrated no significant change in BMI ($p = 0.130$), with a trend toward increased average BMI. This result may be attributed to insufficient exercise frequency, as all participants in the control group engaged in physical activity fewer than three times per week (Harun & Hadi, 2021; Wahyuningsih, 2015). Low levels of physical activity reduce energy expenditure, resulting in unused stored energy and fat accumulation, which contributes to weight gain (Kharb et al., 2011; Sukianto et al., 2020). The imbalance between caloric intake and energy expenditure leads to increased BMI, especially when excessive food intake is not accompanied by adequate exercise. A similar pattern was observed in a study examining the relationship between physical activity, stress, and obesity among civil servants at the Secretariat General of the Ministry of Health of the Republic of Indonesia, which also reported BMI increases among participants with low physical activity levels (Hematabadi, 2025; Kamal et al., 2013).

A comparison between the intervention and control groups using the independent t-test revealed a significant difference in BMI change ($p = 0.043$), confirming that walking exercise contributed to BMI reduction. This finding aligns with research by Kamal et al. (2013), which examined the effects of brisk walking four times per week for two weeks and reported significant reductions in BMI in the intervention group. The decrease in BMI in the present study may be attributed to consistent exercise, which increases fat oxidation and basal metabolic rate through ATP utilization during physical activity, ultimately contributing to weight reduction.

This study did not control variables such as dietary patterns, medication use, and genetic factors, which may influence BMI changes. However, lifestyle modification through increased physical activity remains an effective strategy to control overweight and obesity. Based on these findings, it can be concluded that walking exercise significantly reduced BMI among overweight and obese employees in the intervention group, as demonstrated by statistical differences between pretest and posttest values.

Conclusion

Based on the results of this study, it can be concluded that walking exercise has a significant effect on reducing Body Mass Index (BMI) among employees who are overweight and obese. The intervention group showed a statistically significant difference between pretest and posttest BMI values ($p = 0.034$), while the control group did not experience a significant change ($p = 0.130$). Furthermore, a significant difference was found in the mean BMI change between the intervention and control groups ($p = 0.01$), indicating that regular walking exercise is effective in reducing BMI.

As a follow-up to the findings of this research, participants are encouraged to maintain regular physical activity, particularly walking exercise, and adopt a healthy lifestyle to prevent overweight and obesity. Educational institutions are advised to develop routine physical activity programs such as weekly walking sessions and provide safe and comfortable sports facilities for the academic community, including staff, lecturers, and students. Future researchers are recommended to include additional variables such as dietary patterns and to expand the study scope to more faculties at Nusa Cendana University to obtain more comprehensive results.

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