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Original Research Article

Effects of Pyramid Resistance Training Method on Body Composition Among Individuals Supplementing with 5 mg Creatine Monohydrate

Burhaan Shodiq[1]*, Bagus Aryatama[1], Muhamad Ihsan Hufadz[1], Inosen Lingsir Maghribi[1], Fahrizal Akbar Herbhakti[1]

[1]*Rekayasa Keolahragaan, Fakultas Teknologi Industri, Institut Teknologi Sumatera, Indonesia*

*email penulis korespondensi: burhaan.shodiq@ro.itera.ac.id

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Abstract

Body composition is a key indicator in assessing an individual's fitness level and health status. This study examines the effects of pyramid resistance training and 5 mg of creatine monohydrate supplementation on body composition measures, including body weight, BMI, body fat percentage, and muscle mass percentage. The population in this study consisted of males aged 20 to 25 years who actively participated in training programs at a fitness center in Region X. This research employed a quasi-experimental design with pretest and posttest measurements. Body composition was measured using bioelectrical impedance analysis (BIA). All data were analyzed in SPSS version 27.0.1.0 using paired-samples t-tests with a significance level of 0.05. The results show a statistically significant change (p < .001) in all variables after the intervention, body weight increased by an average of 1.98000 kg, BMI showed an average increase of 0.70667, body fat percentage decreased by an average of -1.87333%, and muscle mass percentage increased by an average of 1.25333%. These findings suggest that combining the pyramid resistance training method with creatine monohydrate supplementation may have a positive impact on body composition.

Keywords: body composition, body fat percentage, creatine monohydrate, pyramid training method, resistance exercise, skeletal muscle mass

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1. INTRODUCTION

Body composition is a critical metric for evaluating an individual's physical fitness and overall health, particularly among those who engage in regular physical activity, such as athletes and fitness enthusiasts. According to Handayani et al. (2023), the composition of the human body is typically measured by the body mass index (BMI), which is a metric used to determine whether a person's weight is within a healthy range. BMI is calculated by dividing a person's weight by the square of their height. Other components of body composition include body fat, muscle mass, and bone mass. It encompasses several main components such as body weight, BMI, body fat percentage, and muscle mass percentage. Monitoring body composition is essential, as imbalances can increase the risk of various degenerative diseases such as obesity, diabetes, and cardiovascular disorders (Desiree et al., 2024; Jia et al., 2023; Sanca et al., 2025). Therefore, maintaining and improving healthy body composition has become a primary focus in both training programs and nutritional interventions.

Resistance training is a form of physical exercise that offers numerous benefits, particularly in enhancing muscle strength, bone density, and metabolic function (Bärg et al., 2025; Candow & Moriarty, 2025a; Ghayomzadeh et al., 2025; Guo et al., 2025). According to Sutanto et al. (2019), resistance training is a program designed to build muscle mass, contributing to a more athletic body composition. Nasrulloh & Shodiq (2020) describe resistance training as a physical activity that involves the use of external loads to improve an individual's strength capacity, with objectives that may include developing muscular strength, endurance, hypertrophy, athletic performance, or a combination of these goals. Adi et al. (2023) further emphasize that resistance training is one of the most effective methods for increasing physical strength, involving the use of external weights or the athlete's own body weight as resistance. In the context of improving body composition, resistance training has been shown to be effective in increasing muscle mass and reducing body fat.

One popular resistance training approach is the pyramid method. This method refers to a progressive training system in which exercise intensity (load) is gradually increased while the number of repetitions decreases in each set and then decreases again to resemble the shape of a pyramid. The pyramid method provides maximal muscle stimulation, promotes muscular hypertrophy, and simultaneously improves both strength and muscular endurance. According to Siska et al. (2019), pyramid sets involve beginning with a high number of repetitions using lighter weights, followed by successive sets with decreasing repetitions and increasing weight in a progressive manner. The pyramid method is an effective resistance training approach for improving performance and body composition. According to Azhari et al. (2021) pyramid-style resistance training effectively increases muscle mass. This is consistent with the findings of Shodiq et al. (2023), the study concluded that pyramid set training leads to significant muscle hypertrophy. This method promotes greater muscular adaptation due to the systematic variation in training intensity and volume. Additionally, the pyramid approach allows for diverse training stimuli that help prevent workout monotony and optimally stimulate different muscle fiber types. Over time, pyramid training can lead to more substantial gains in muscle mass compared to conventional methods.

Alongside physical training, nutritional supplements are key to enhancing body composition. One of the most widely studied and used supplements in the field of fitness and sports is creatine monohydrate (Smith-Ryan et al., 2021). Creatine is a compound found naturally in the body and is involved in energy production, particularly during high-intensity, short-duration activities. According to Yamaguchi et al. (2025), Creatine monohydrate supplementation has been demonstrated to have several notable effects on the human body. Firstly, it has been shown to accelerate recovery from exercise-induced muscle damage. Secondly, it has been demonstrated to help preserve muscle function. Finally, it has been shown to reduce post-exercise discomfort.

Creatine monohydrate has been identified as a practical nutritional strategy to support recovery not only among athletes but also within the general population. Scientifically, creatine monohydrate has been demonstrated to improve exercise performance, accelerate muscle recovery, and augment lean body mass. The regular and measured use of creatine monohydrate has been demonstrated to augment intramuscular phosphocreatine levels. These levels serve as a rapid energy source during periods of high-intensity muscle contraction. A study by Askow et al. (2022) demonstrated that creatine monohydrate supplementation significantly increases muscle mass.

The long-term side effects of creatine remain unclear, but it is known to increase muscle cell water content, enhancing muscle size and supporting protein synthesis. According to Wu et al. (2022), creatine is widely regarded as an effective supplement for increasing muscle mass in healthy young adults, particularly when used in conjunction with structured training programs. This effectiveness appears consistently across different dosing strategies and types of physical activity. Moreover, Candow & Moriarty (2025b) reported that creatine monohydrate supplementation provides various benefits for adults experiencing sarcopenia, such as loss of skeletal muscle mass, strength, and physical function. The combination of resistance training and creatine supplementation has been widely studied and has shown positive effects on strength, endurance, and muscle mass improvements.

Nonetheless, the majority of prior research has primarily examined the overall impact of creatine supplementation or its integration with standard resistance training protocols. There remains a lack of research specifically examining the impact of pyramid resistance training combined with creatine monohydrate supplementation, particularly on various aspects of body composition such as body weight, BMI, body fat percentage, and muscle mass percentage. According to Fasitasari et al. (2024), components of body composition such as fat mass and muscle mass can influence an individual's health prognosis. Low muscle mass in aging populations is associated with chronic illnesses or increased disease severity, while high fat mass is linked to cardiometabolic risk. Therefore, it is essential to investigate whether the combination of structured training methods and supplementation yields more significant improvements in body composition compared to implementing either intervention alone. His study examines how pyramid resistance training with 5 mg creatine monohydrate affects body composition. The research examines body weight, BMI, body fat percentage, and muscle mass percentage. The study aims to clarify how combined training and supplementation affect body composition and provide practical guidance for fitness professionals, athletes, and the public seeking safe, effective physique improvement.

In addition, the findings of this study are expected to inform the development of structured training programs that not only emphasize general weight loss but also prioritize the ideal balance between muscle mass and body fat. A well-balanced body composition positively impacts physical performance, body aesthetics, and long-term health. In the context of modern fitness, evidence-based scientific approaches such as this are essential to prevent inappropriate training practices and improper supplement use.

Therefore, through this research, the author seeks to quantitatively evaluate how pyramid resistance training, when combined with creatine monohydrate supplementation, affects body composition. The principal objective of the study is to enhance muscle mass, while also assessing its impact on additional parameters including body weight and body fat percentage. This comprehensive perspective is crucial in assessing the overall effectiveness of the intervention. This research is also highly relevant in addressing the growing demand among urban populations for effective and efficient fitness programs. Amidst increasingly sedentary modern lifestyles, the need for well-structured training and nutritional strategies has become more critical. Therefore, the data and findings from this study can serve as a foundation for designing more targeted and personalized fitness programs that align with everyone's physiological condition.

Overall, this study is expected to provide new insights in the field of sports science, particularly regarding the optimization of training and supplementation strategies to achieve ideal body composition. The application of the pyramid resistance training method in combination with creatine monohydrate supplementation represents a promising and scientifically grounded approach that can be adopted as a practical solution to improve individuals' quality of life through enhanced physical fitness and overall health.

2. RESEARCH METHOD

This study used a quantitative quasi-experimental design. According to Susila (2021), a quasi-experiment is a type of research design that resembles a true experiment but does not involve full randomization in group assignments. Specifically, the study adopted a pretest-posttest one-group design. This design was chosen to observe changes in body weight, body mass index (BMI), body fat percentage, and muscle mass percentage, before and after the intervention consisting of pyramid method resistance training and daily supplementation of 5 mg creatine monohydrate.

2.1 Participants

The population in this study consisted of males aged 20 to 25 years who actively participated in training programs at a fitness center in Region X. Participants were selected using purposive sampling with the following inclusion criteria: males aged 20–25 years, no history of kidney, cardiac, or metabolic diseases, had not taken creatine supplements in the previous three months, and were willing to participate in the six-week intervention program. Exclusion criteria included participants who experienced injury or illness during the intervention period and those who failed to attend training sessions at least twice per week. A total of 15 participants were included in the study.

2.2 Research Design

This study was designed using an experimental approach, as it aims to determine the influence or effect of a specific treatment on certain variables. The design employed is one-group pretest-posttest design. In this design, participants will undergo pyramid resistance training and consume 5 mg of creatine monohydrate daily. Body composition measurements are conducted before and after the intervention. The intervention will be carried out over several weeks, with supervision to ensure adherence to the training program and supplement intake. Additionally, efforts will be made to control other influencing factors such as diet and physical activity outside the training sessions.

2.3 Instruments

This study used a validated Bioelectrical Impedance Analysis (BIA) device to measure body weight, BMI, body fat percentage, and muscle mass percentage. Attendance records and training observation forms tracked participant compliance.

2.4 Procedures

This research procedure was designed to be implemented over 16 sessions across approximately 8 weeks, with a training frequency of twice per week. In the initial session, participants attended an orientation outlining the study and signed informed consent. Baseline (pretest) measurements of body weight, BMI, body fat percentage, and muscle mass percentage were then taken. Participants also completed a health and exercise history questionnaire and were provided with a daily 5 mg dose of creatine monohydrate, which they began consuming from the first day of the intervention. In the second session, participants underwent a basic fitness assessment and were introduced to pyramid method resistance training techniques. During this phase, their initial training loads were adjusted based on a One Repetition Maximum (1RM) or submaximal load estimation.

From sessions three to fourteen (a total of 12 core training sessions), participants performed pyramid method resistance training under direct supervision. Each training session comprised primary compound movements, including squats, bench presses, deadlifts, shoulder presses, and barbell rows. The pyramid structure typically followed this pattern: Set 1: 12 repetitions with light weight, set 2: 10 repetitions with moderate weight, set 3: 8 repetitions with heavier weight, set 4: 6 repetitions with maximal weight. Participants continued daily creatine supplementation throughout the intervention period, on both training and rest days. Adherence to training and supplementation protocols was monitored and recorded regularly. At the fifteenth session, all body composition variables were measured again with the same BIA device to assess changes. The final session (session sixteen) was dedicated to final data collection, participant feedback surveys, and the formal conclusion of the study program. This procedure aims to objectively assess how pyramid resistance training and creatine monohydrate supplementation affect body composition.

2.5 Data Analysis

The data obtained from the pretest and posttest measurements will be analyzed to determine the effect of pyramid method resistance training combined with creatine monohydrate supplementation on changes in body composition, including body weight, body mass index (BMI), body fat percentage, and muscle mass percentage. The initial phase of data analysis involves conducting a Shapiro-Wilk test to assess the normality of the data distribution. Should the results indicate that the data are normally distributed, appropriate parametric tests will be employed. Specifically, the paired sample t-test is utilized to evaluate differences between pretest and posttest measurements.

All data processed and analyzed using SPSS version 27.0.1.0 with a significance level set at 0.05**.** The results of the analysis used to determine whether the pyramid method resistance training combined with creatine monohydrate supplementation has a statistically significant effect on the body composition of the study participants.

3. RESULTS

Before conducting a paired sample t-test, a prerequisite test for analysis was carried out, namely a normality test using Shapiro-Wilk because the sample was below 50. Table 1 presents the Shapiro-Wilk test results for assessing the normality of all variables in both pre-test and post-test conditions. The findings indicated that both pretest and posttest data for body weight, BMI, body fat percentage, and muscle mass percentage were statistically consistent with a normal distribution ($p > .05$). The Shapiro-Wilk statistic (W) values ranged from .949 to .990 across variables, with all significance levels substantially exceeding the $\alpha = .05$ threshold. This confirms that the null hypothesis (H_0) of normality cannot be rejected for any variable in either condition, thereby satisfying the parametric assumption of normality for subsequent analyses.

Table 1.

Normality test results

	Shapiro-Wilk		
	Statistic	df	Sig.
Body Weight Pre-test	.949	15	.506
Body Weight Post-test	.950	15	.520
BMI Pre-test	.953	15	.571
BMI Post-test	.950	15	.519
Body Fat Percentage Pre-test	.979	15	.965
Body Fat Percentage Post-test	.979	15	.962
Muscle Mass Percentage Pre-test	.990	15	.999
Muscle Mass Percentage Post-test	.989	15	.999

Source: Primary Data

The paired-samples t test was conducted to analyze the significant differences between *pre-test* and *post-test* measurements on four body composition variables. The results in table 2 show a statistically significant change ($p < .001$) in all variables after the intervention. For the first variable, body weight increased by an average of 1.98000 kg (*SD* = 0.31214) with a value of t (14) = 24.568. In the second variable, BMI showed an average increase of 0.70667 (*SD* = 0.17099) supported by the value of t(14) = 16.006. Meanwhile, the percentage of body fat decreased by an average of -1.87333% (*SD* = 0.39545) with a value of t(14) = 18.347. Finally, the percentage of muscle mass increased by an average of 1.25333% (*SD* = 0.16417) with a value of t(14) = 29.567. The value (*Sig.)* is entirely below .001, confirming that all changes are statistically significant ($\alpha = .05$). These findings indicate that the interventions administered effectively affect all the body composition parameters tested.

Table 2.

Paired-Samples T Test Results

		Paired Differences				
		Mean	Std. Deviation	t	df	Sig. (2-tailed)
Pair 1	Body Weight Post-test - Body Weight Pre-test	1.98000	.31214	24.568	14	<.001
Pair 2	BMI Post-test - BMI Pre-test	.70667	.17099	16.006	14	<.001
Pair 3	Body Fat Percentage Post-test - Body Fat Percentage Pre-test	-1.87333	.39545	-18.347	14	<.001
Pair 4	Muscle Mass Percentage Post-test - Muscle Mass Percentage Pre-test	1.25333	.16417	29.567	14	<.001

Source: Primary Data

4. DISCUSSION

According to this study, the combination of pyramid resistance training and creatine monohydrate supplementation at a dosage of 5 mg/day produced statistically significant effects on all measured body composition parameters ($p < .001$). These findings are consistent with the physiological mechanisms underlying resistance training and creatine supplementation.

The significant increase in body weight (mean +1.98 kg) and body mass index (BMI) (mean +0.71) observed in individuals undergoing a pyramid resistance training program can be explained as a physiological consequence of muscle hypertrophy, rather than an increase in body fat mass. Pyramid resistance training is a resistance training method that involves progressively increasing the weight along with decreasing the number of repetitions in each set of exercises. This approach has been shown to be effective in stimulating skeletal muscle hypertrophy through increased myofibrillar protein synthesis due to high mechanical and metabolic stress (Liu et al., 2024). Muscle hypertrophy is the enlargement of muscle fibers in response to heavy and progressively intense exercise. This process boosts muscle mass and causes weight gain without raising fat levels (Costa et al., 2021).

In addition, creatine supplementation also amplifies the effects of hypertrophy through two main mechanisms. First, creatine causes increased intracellular water retention in muscle tissue, which contributes to increased cell volume and triggers cellular anabolic signals that support muscle growth (Desai et al., 2025). Second, creatine raises the levels of phosphocreatine in muscles, which acts as a rapid source of ATP energy during high-intensity exercise. This allows individuals to perform higher volumes of exercise and facilitates faster muscle recovery (Abbasalipour & Hashemi, 2013).

An analysis using BIA indicated an increase in fat-free mass, with an associated average decrease in body fat percentage of -1.87%. The percentage of fat that is lost is explained through two main physiological mechanisms related to weight training pyramid *resistance training model*. First, this exercise model triggers an increase in *excess post-exercise oxygen consumption*

(EPOC), also known as *the after-burn* effect. EPOC refers to the increased oxygen consumption and energy metabolism that occurs after a workout session is over. This post-exercise metabolic activity can last up to 48 hours, depending on the intensity and volume of exercise, and contributes to increased oxidation of body fat (BaiQuan et al., 2025; Huang et al., 2025; Saleh & Al Husaen Aga, 2025).

Hypertrophy-oriented resistance training, such as *pyramid training*, significantly increases muscle mass, which in turn increases *resting metabolic rate* (RMR). This is because muscle tissue has a higher resting metabolic rate compared to fat tissue; each one-kilogram increase in muscle mass can increase daily RMR by ±13–30 kcal (Wang et al., 2011). Thus, this adaptation creates more efficient metabolic conditions for energy burning and reduction of fat stores.

Creatine supplementation also contributes to reducing body fat indirectly. With increased exercise capacity, the sample was able to perform more intense and longer physical activity, resulting in an increase in total calorie expenditure during exercise. In addition, some studies also indicate that creatine can improve overall body composition, i.e. by increasing lean free mass and reducing relative fat percentage without significantly reducing total body weight. Thus, a decrease in fat percentage reflects increased metabolic efficiency and healthier body composition, rather than just general weight loss (Abbasalipour & Hashemi, 2013).

The increase in muscle mass percentage of +1.25% observed in this study also supported the change in body composition in the samples. The pyramid resistance training method puts significant stress on the muscle fibers. This stress activates the mammalian target molecular pathway of rapamycin (mTOR), which is the main regulator of muscle protein synthesis (Bodine et al., 2001). The activation of mTOR initiates the translation of mRNA and the formation of new myofibrillar proteins, which are the foundation of skeletal muscle hypertrophy. The higher the intensity and volume of exercise, the greater the activation of mTOR and the anabolic response it evokes (West et al., 2009).

Such increased hypertrophic adaptations are amplified by creatine supplementation, which increases *phosphocreatine* reserves in muscles. This allows for faster ATP regeneration during intensive muscle contractions, extending exercise capacity before fatigue occurs (Kreider et al., 2017). In addition, creatine is known to have anti-apoptotic and antioxidant effects that help lower post-workout muscle damage, thereby supporting the recovery process and the formation of new muscle tissue (Safdar et al., 2008).

The synergy between exercise stimulation and metabolic support of creatine not only increases absolute muscle mass but also improves *the muscle-to-fat ratio* significantly. This ratio is an important indicator in assessing metabolic fitness status and risk of chronic metabolic disease. Individuals with higher muscle-to-fat mass ratios tend to have better insulin sensitivity, more stable glucose control, and a lower risk of obesity and metabolic syndrome (Srikanthan & Karlamangla, 2011).

5. CONCLUSION

The study found that combining pyramid resistance training with a daily 5-gram creatine monohydrate supplement significantly improved participants' body composition ($p < .001$). This intervention increases body weight and BMI by promoting muscle growth, without raising fat mass. It results in higher fat-free and muscle mass and lowers body fat percentage.

Pyramid-based weight training can provide a powerful mechanical stimulus to the activation of anabolic pathways such as mTOR, which contributes to protein synthesis and hypertrophic adaptation. This effect is amplified by creatine supplementation which increases ATP availability, prolongs exercise capacity, as well as supports the recovery of muscle tissue. On the other hand, the reduction of body fat is driven by *the after-burn* effect (EPOC) and the increase in resting metabolic rate (RMR) due to increased muscle mass, all of which contribute to a more efficient metabolic environment.

Overall, the synergy between pyramid model resistance training and creatine supplementation not only increases muscle mass and lowers body fat, but also significantly improves the muscle-to-fat ratio. This improvement in body composition has positive implications for metabolic health and the potential for preventing chronic diseases later in life. Therefore, this approach can be considered as an effective exercise and nutrition strategy in fitness interventions and quality of life improvement.

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