Optimizing Bodybuilding Training Frequency for Weight Loss and Psychological Well-Being in Overweight Individuals: A 12-Week Study

Wei Chen [1*], Syahrul Ridhwan Morazuki [1]

Abstract

Background: The increasing incidence of overweight and obesity raises a global public health challenge, with overweight individuals (BMI 25–29.9) at higher risk for chronic diseases like cardiovascular conditions and diabetes (WHO, 2024). While lifestyle changes, including dieting and exercise, are key strategies for weight management, bodybuilding is gaining attention for its potential in fat loss and improving body composition. However, the optimal frequency for bodybuilding sessions in overweight individuals remains unclear. This study explores the effects of different training frequencies on body weight, BMI, and fat loss. Methods: This cross-sectional study involved 90 participants, all classified as overweight (BMI 25–29.9). Participants were recruited through online advertisements and were divided into three groups, each following a 12-week bodybuilding training regimen with varying frequencies: twice, thrice, or five times weekly. Baseline body weight and BMI were recorded before training, and changes were assessed at the end of the program. A short questionnaire evaluated the effects of the training on weight loss, body composition, and psychological outcomes. Results: This study involved 90 participants, primarily aged 25-34 (48.9%). The demographic analysis revealed that males constituted 66.7% of the sample, exhibiting a mean weight loss of 75.23 pounds ($p < 0.001$) after 12 weeks of bodybuilding training, effectively rejecting the hypothesis that bodybuilding training has no significant impact on weight loss. Additionally, while no significant differences in weight loss were observed based on training frequency ($F(2, 87) = 0.791$, $p = 0.457$), both weight loss and body mass index (BMI) significantly improved with training. Conclusion: Overall, regular bodybuilding training positively influenced weight loss, body composition, and psychological well-being.

Keywords: Bodybuilding, Weight Loss, BMI Reduction, Fat Loss, Training Frequency, Physical Fitness.

Significance | This research provides essential insights into bodybuilding training's influence on weight loss, BMI, and psychological well-being, informing effective interventions for overweight individuals.

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Introduction

Over recent decades, the increasing incidence of overweight and obesity has emerged as a critical public health issue. This rise in excess body weight poses significant threats to global health, particularly due to its strong association with various chronic diseases. According to the World Health Organization (WHO), individuals with a Body Mass Index (BMI) ranging from 25 to 29.9 are classified as overweight, a condition that significantly elevates the risk of developing cardiovascular diseases, diabetes, and certain types of cancer (WHO, 2024). The prevalence of overweight is strikingly high across all age groups, with the WHO reporting that, as of 2022, over 390 million children and adolescents aged 5 to 19 years, as well as 2.5 billion adults aged 18 years and older, fell into

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this category (WHO, 2024). As this global health problem persists, there has been an increased emphasis on strategies for weight control, including lifestyle modifications like dieting and exercise.

Among the many forms of exercise promoted for weight management, strength training—particularly bodybuilding—has garnered significant attention due to its potential to induce fat loss and improve body composition (Lopez et al., 2022). Weight training, a form of resistance exercise that focuses on muscle development through repeated use of external resistance, is becoming increasingly popular not only for its aesthetic benefits but also for its therapeutic potential. Research suggests that resistance training can improve metabolism, promote lean body mass, and contribute to weight reduction, making it an essential component of weight management interventions (Miller et al., 2018). However, while bodybuilding offers numerous health benefits, the most effective training frequency for achieving fat loss and BMI improvement in overweight individuals remains uncertain (Campa et al., 2020).

The potential impact of resistance training on fat loss and body composition is well established, yet determining the optimal training frequency for these outcomes has proven more elusive. Studies suggest that exercise, in general, leads to significant reductions in weight and BMI, but the effects of different training frequencies are less conclusive (Jakicic et al., 2018). Some evidence indicates that daily strength training may be more effective for weight loss and BMI reduction, as it leads to greater overall energy expenditure (Shakiba et al., 2019). However, other research suggests that less frequent but higher-intensity training sessions may yield similar, or even superior, results due to the increased rest and muscle recovery time between sessions, which is critical for muscle growth and repair.

Fat loss, particularly the reduction of visceral fat, is a crucial goal in the management of overweight and obesity. Visceral fat, which accumulates around the internal organs, is strongly linked to metabolic diseases such as type 2 diabetes and cardiovascular disease. While aerobic exercise has traditionally been recommended for fat loss, there is growing recognition of resistance training's role in promoting fat reduction and improving body composition. However, how the frequency of bodybuilding training influences fat loss, especially visceral fat, remains an area requiring further investigation. This is important because individualized exercise prescriptions could greatly enhance fat loss outcomes, particularly in the overweight population (Ruiz-Castellano et al., 2021).

In addition to its physical benefits, bodybuilding training may also exert positive psychological effects, which are often overlooked in weight loss programs. Exercise, including resistance training, has been shown to improve mood, reduce anxiety, and boost self-esteem. These psychological benefits are critical for promoting adherence to training programs, which in turn leads to greater long-term health improvements (Rustaden et al., 2017). For overweight individuals, especially those struggling with motivation and confidence, the psychological gains associated with regular exercise may be just as important as the physical ones in facilitating lasting weight loss and health improvements.

Given the importance of optimizing training frequency for both physical and psychological outcomes, the current study seeks to assess the impact of different bodybuilding training frequencies on body weight, BMI, and fat loss in overweight individuals. Specifically, the research aims to identify the optimal training frequency that produces the most significant improvements in these health markers. By determining the best training regimen, the study hopes to provide evidence-based recommendations that can improve the effectiveness of bodybuilding programs for overweight individuals and enhance their overall well-being.

The overarching aim of this study is to determine the effectiveness of different bodybuilding training frequencies in promoting weight loss and body fat reduction in overweight individuals. More specifically, the research seeks to identify which training frequency—whether participants complete bodybuilding workouts 2, 3, or 5 days per week—produces the most substantial changes in body weight, BMI, and fat loss. This investigation will also consider whether the regularity of bodybuilding training is associated with improvements in psychological well-being, such as enhanced self-esteem and reduced anxiety, which are important factors in weight loss and long-term health.

The research questions guiding this study are centered on exploring the relationship between bodybuilding training and weight loss, BMI improvement, and fat reduction. The first question asks whether there is a significant relationship between bodybuilding training and weight loss in the study population over a 12-week period. The second question seeks to determine if training frequency, whether 2, 3, or 5 days per week, has a significant impact on weight loss during the same time frame. The third research question focuses on whether bodybuilding training leads to BMI improvement over the 12-week period. Similarly, the fourth question explores whether different training frequencies—2, 3, or 5 days per week—affect BMI improvement. Lastly, the fifth question investigates whether the regularity of bodybuilding training is associated with body fat reduction outcomes, including weight loss, improvements in body composition, physical fitness, and psychological well-being.

To address these research questions, five hypotheses will be tested. The first hypothesis proposes that there is no significant relationship between bodybuilding training and weight loss in the study population over the 12-week period. The second hypothesis states that the frequency of bodybuilding training—whether participants train 2, 3, or 5 days per week—does not have a

significant effect on weight loss. The third hypothesis suggests that there is no significant relationship between bodybuilding training and BMI improvement in the population over the same period. The fourth hypothesis similarly posits that training frequency does not significantly impact BMI improvement. Finally, the fifth hypothesis suggests there is no significant association between the regularity of bodybuilding training and outcomes related to fat loss, body composition improvement, physical fitness, or psychological well-being.

This research will provide valuable insights into the role of training frequency in optimizing bodybuilding programs for overweight individuals. By addressing existing gaps in the literature, the findings aim to enhance weight management strategies and offer more tailored interventions for this vulnerable population.

2. Literature Review

2.1. Overview of Bodybuilding Training and its Impact on Weight Loss

Bodybuilding training, a program aimed at increasing muscle mass, body composition training usually includes exercises that involve weights like weight training and requires the observation of certain nutritional plans. The effectiveness of bodybuilding in weight control and muscle building has remained a subject of interest in the recent past. Studies reveal that bodybuilding aids in the development of muscles but also helps control fat, which is also an essential determinant of body weight (Vecchio, 2022; Rukstela et al., 2023). Increasingly, several studies have backed the role of bodybuilding in managing weight. Barakat et al (2020) conducted a narrative review noting that body recomposition — the process of the increase in lean mass and the decrease in fat mass simultaneously among bodybuilders who perform resistance training. This study further supports the fact that while it is usually more difficult to gain muscle in trained subjects, bodybuilding enables the desired balance of muscle growth and fat loss. In accordance with the current study, another study by Bellicha et al. (2021) also supported it, showing that exercise, including resistance training, results in considerable decreases in body weight, fat mass, and visceral fat, which are important for metabolic health. This supports the notion that bodybuilding can go a long way in helping to reduce weight and eventually manipulate body composition.

The ways through which the bodybuilding process affects weight loss are quite complex. Strength training helps build up muscle tissue, so more energy is used at rest because of an overall higher metabolic rate. According to Ruiz-Castellano et al. (2021), while losing fat, it is crucial to maintain fat-free mass and minimize fat mass by using the correct dietary approach complemented with resistance training. Other studies also support the relationship between bodybuilding and weight loss. In a cross-sectional study of professional and amateur bodybuilders by Makiel et al. (2020), it was found that professionals, who probably exercise more, were characterized by a significantly lower percentage of their total body fat. This implies that the frequency and duration of bodybuilding activities determine enhanced physiques among individuals. However, certain aspects of the results are more complicated than they may initially appear. For example, Sultana et al. (2019) identified that low low-volume high-intensity interval training bodybuilding routine enhanced the cardiovascular exercise adaptation but did not significantly result in fat mass or its percentage modification. This suggests that though bodybuilding has a positive impact on body composition, the degree of impact can be determined by the types of training engaged in. Thus, bodybuilding training, resistance exercises, and proper nutrition plans correspond to losing weight and improving body composition.

2.2. Frequency of Bodybuilding Training and BMI Improvement

The frequency of bodybuilding training is another factor that impacts overall health reflecting such factors as body mass index (BMI) gain. Much research has been done on the effects of training frequencies on health so as to determine how frequency affects change in health outcomes. A systematic review by Chin et al. (2019) showed that low-frequency high-intensity interval training could enhance body composition, such as decreased BMI, in overweight individuals. They revealed that those in the group that trained at least once or twice per week showed great reductions in BMI and percent body fat mass along with an improvement in VO_2 max, again highlighting that even low exercise frequency has an impact on health. The frequency of workouts has also been an area of interest in studies, especially in the context of weight loss and muscle gain. Campa et al. (2020) established that exercising at a greater frequency of three times a week offered benefits of lower body weight, BMI, and fat mass as opposed to lower frequencies. In their investigation regarding overweight females, they found out that the women who had more resistance training sessions had more weight loss and significant enhancements in muscular and cardiovascular health. This implies that one would require more frequent training in order to reap the benefits of bodybuilding on BMI and other aspects of health.

Other longitudinal studies that monitor BMI fluctuations while regularly exercising help our understanding. In a 12-week trial studying three sets per exercise, Pina et al. (2020) focused on the impact of a resistance training frequency for older women of two or three sessions per week. It was revealed that both the groups had an improvement in leaning muscle mass, but a significant decrease in body fat and BMI only occurred in the three times per week trainees. This study suggests that further training might be very important in attaining the desired shift in BMI in the long run. However, other research differs with the high-frequency training frequency. To further provide evidence for this study, previous

research by Gomes et al. (2019) noted that there was no difference in both muscle mass and strength improvements among individuals conducting high-frequency resistance training five times a week and those performing the low-frequency resistance training only once a week if the total weekly volume of the exercise was the same. This implies that in a condition where the total volume of exercise is equal, the sole parameter of frequency may not be solely responsible for the increase in BMI and muscle mass. In a study, Aziz et al. (2020) evaluated the effects of weight training on BMI, muscle mass, and body fat percentage in overweight men. While weight training improved muscle endurance, it did not lead to significant changes in BMI during the 4-week intervention. Moreover, Aboshkair et al. (2023) also focused on the impact of circuit training on BMI and physical fitness in overweight female students. It found a significant reduction in BMI and improvements in health-related physical fitness after the training intervention. As a result, despite the research findings that show a link between higher training frequency and an increase in BMI, there is evidence that could indicate that this necessity would vary depending on the total amount of training, the type of exercise, as well as the subject's profile.

2.3. Body Fat Loss and Bodybuilding

The use of bodybuilding training has been known to have both a direct and indirect impact on body fat loss. In a more straightforward manner, bodybuilding training results in reduced body fat through enhanced energy expenditure and muscle growth. A study conducted by Schoenfeld et al. (2020) revealed that by engaging in a high-frequency, whole-body training regimen, bodybuilders were able to strip down their body fat to very low levels especially when preparing for a show. This change in body composition was achieved without compromising the body's muscle mass, thus proving the efficiency of bodybuilding. Apart from the direct effects, bodybuilding also has an indirect effect on body fat through the enhancement of the metabolic rate. It has been proven that bodybuilding training increases the basal metabolic rate, which means the body will burn even more calories when at rest. According to Barakat et al. (2020), body recomposition is the ability to increase muscle mass while decreasing fat mass, and bodybuilding training with proper nutrition can help in achieving this goal even in trained people. This means that bodybuilding not only aims at fat loss but also aims at improving the metabolic rate of the body.

In addition, the psychological effects of bodybuilding have also been well-studied. Bodybuilding has been observed to boost self-esteem, enhance mood, and alleviate symptoms of depression and anxiety when practiced on a consistent basis. In research, Batrakoulis and Fatouros (2022) analyzed the psychological benefits of high-intensity interval training (HIIT) for overweight adults. It reported that HIIT, which shares similarities with bodybuilding in its metabolic effects, can lead to significant improvements in mental health, self-esteem, and quality of life, often surpassing those achieved with moderate-intensity exercise. Thus, training in bodybuilding leads to a decreased body fat content, increased metabolic rate, better and improved body shape, and a drastic improvement of psychological self-status.

2.4. Theoretical Framework

One of the most suitable theories for underpinning this research is the Social Cognitive Theory, developed by Albert Bandura (Suyanto et al., 2016). According to SCT, learning takes place in a social context through a continuous transaction between the person, the environment, and behavior (Devi et al., 2017). At the core of this theory is self-efficacy, defined as the belief in one's ability to engage in behaviors that will help achieve specific performance outcomes (Woodcock & Tournaki, 2023). SCT is particularly relevant to this study, as it can account for how self-efficacy concerning participants' ability to perform the required frequency of training and performing intensive bodybuilding sessions may affect the actual process of adhering to the prescribed training frequencies. Second, observational learning, which is another feature of SCT, postulates that people can learn actions by watching other individuals and the rewards or punishments that they get. With regard to this study, it may help participants notice others who adhere to a bodybuilding regime and lose weight and this might compel them to change and adopt such behaviors to increase training frequency and better body physique. Hence, SCT is a comprehensive theory that can be used to explain the psychological and social processes that lead to the persistence of exercising and subsequent health changes.

2.5. Conceptual Framework

The identified conceptual framework helps to understand how the independent variable interferes with the dependent variables in research focusing on the training frequency of bodybuilding (Figure 1). In this research study, the independent variable of Bodybuilding Training Frequency is examined to find out its impact on dependent variables including Weight Loss, BMI Improvement, and a set of Body Fat Reduction Outcomes. These outcomes include other detailed features like weight loss, body shape change, physical fitness, and psychological health improvement. The arrows represent the proposed effect of training frequency in the aforementioned areas; consequently, variation in the behavior of bodybuilding training of the participants is expected to result in changes in these health and well-being indices. This framework organizes the research by specifying the causal relationships between the variables in order to determine how different levels of training impact physical and psychological well-being.

3. Methodology

3.1 Research Design

This research is of cross-sectional study type. It is a research design that involves collecting information from a specific population at a fixed time only (Setia, 2016). Cross-sectional research is an effective one for examining the correlation between various factors and for getting a picture of the outcome measures in a certain period. This design is particularly important for this study as it facilitates the determination of the effect of varying frequency of bodybuilding training on weight and BMI in the duration of 12 weeks. The study has significant advantages due to the concurrent analysis of data from different groups, allowing for a comprehensive assessment of how varying the bodybuilding training frequency influences body composition and the general health of overweight people.

3.2 Data Collection and Sampling

The process of data collection was initiated with an online advertisement published on the most frequented social media sites. This particular advertisement featured a link for people who wanted to sign up, allowing them to input personal details such as their age, weight, and interest in bodybuilding. The use of social media made it easier to have a large sample size and participants of different ages were willing to take the surveys. Upon getting enough responses, Purposive sampling was employed to select 90 participants who met the criteria for being overweight, defined as having a Body Mass Index (BMI) between 25 and 29.9. This BMI range is calculated as weight in kilograms divided by height in meters squared. Such participants were considered overweight and appropriate for the study. Prior to the actual conduct of the study, the participants' initial body weight and BMI were taken to have a basis. Subsequent to this, the participants were put through a bodybuilding training regime that comprised 12 weeks of training. They were divided into three groups of 30 participants each, between which the training frequency varied: one group exercised twice a week, another – three times a week, and the third – five times a week. Such grouping made it possible for researchers to assess the effects of varying training frequency on weight as well as BMI. At the end of the twelve-week training period, the participant's body weight and BMI were once again taken to determine any changes. At the end of bodybuilding training, they filled in a short questionnaire to assess the roles and effects of bodybuilding training on weight loss and improvement of body shape, increase in physical fitness, and psychological effects of the training. Thus, this approach offered a detailed analysis of the outcomes of the training frequencies and the overall impact they had on the health of the participants.

3.3 Research Participants

The participants in this study were 90 individuals, 60 males and 30 females, aged between 18 and 65 years. All the subjects were categorized to be overweight and each of the participants a had Body Mass Index (BMI) between 25 and 29.9. The participants were selected randomly without discriminating the gender which enabled favorable representation. All the participants reported their interest and willingness to undergo a 12-week bodybuilding training program for the purpose of measuring the effects of the frequency of the training on the weight and BMI of the participants.

3.5 Survey Structure

Following the completion of the 12-week bodybuilding program, an online questionnaire consisting of a few questions was used to evaluate the effects of the training on losing fat, improving body shape and weight, enhancing physical fitness, and promoting mental health (Appendix A). All the participants were e-mailed the link to the survey and they were free to complete the survey at their leisure. The initial part of the survey consisted of four elementary questions related to the respondent's age, gender, health state, and presence of chronic illnesses. The second portion asked five questions about respondents' bodybuilding program participation and its effects on weight loss, body shape alterations, physical fitness, and psychological well-being. These second-half questions were based Likert scale. The survey was short and only took about 5 minutes to fill out.

3.6 Data Analysis

In analyzing the data for this study, SPSS was used as the software for all the statistical computations. Descriptive statistics as well as regression analysis, one-way ANOVA, and paired t-tests were used to analyze the results and examine different hypotheses. These analyses were performed to determine the interaction of training frequency with weight loss, BMI, and fat loss which gave a broader picture of the effects of training programs on overweight subjects.

3.7 Ethical Consideration

In regards to the ethical emphasis, those participants who agreed to participate were provided with an information sheet and consent form together with the survey questionnaire. Participants were told that they had the right to withdraw their participation from the study at any given time without being punished. Concerning the data collection, the participants were assured that all the data would be collected anonymously and safeguarded to prevent other entities from obtaining the data. This approach ensured ethical practices in the study by protecting the participants' self-determination, anonymity, and privacy.

4. Results

4.1. Demographic Data Analysis and Interpretation

The current research demographic and survey response data encompass 90 participants. In terms of age distribution, most participants are within the 25-34 age range, accounting for 48.9% (44 participants), followed by those aged 18-24 at 34.4% (31 participants), and 15.6% (14 participants) are between 35-44 years (Table 1). The smallest group, under 18, comprises only 1.1% (1 participant) with a mean response score of 2.79 and a standard deviation of 0.71, indicating moderate variability in responses within this group. Regarding gender, males represent a larger

portion of the survey population, making up 66.7% (60 participants), and have a more uniform response pattern with a mean score of 1.33 and a standard deviation of 0.47. Females account for 33.3% (30 participants). The survey also evaluated the participants' overall health perception, where 61.1% (55 participants) rated their health as "Good," 24.4% (22 participants) as "Fair," and 14.4% (13 participants) as "Very Good," with the latter group having a mean response score of 3.10 and a standard deviation of 0.62, suggesting moderate consistency in their perception of health. When assessing pre-existing medical conditions, 54.4% (49 participants) feel they "Probably Not" have conditions, whereas 27.8% (25 participants) are unsure ("May or May Not"). Only a small fraction, 3.3% (3 participants), believe they "Probably Yes" have conditions. Those certain about not having conditions ("Definitely Not") represent 14.4% (13 participants) and display a mean response score of 2.20 with a standard deviation of 0.72, indicating relatively high variability in their health self-assessment.

4.2. Hypothesis Testing

4.2.1. *H_1*: There is no significant relationship between bodybuilding training and weight loss in the study population over the 12-week period.

The paired samples t-test was conducted to examine the relationship between bodybuilding training and weight loss over a 12-week period. Results showed a significant weight loss from the pre-test (M = 228.73 lb, SD = 17.835) to the post-test (M = 153.50 lb, SD = 16.023), with a mean difference of 75.233 pounds (SD = 19.139, SE = 2.017). The 95% confidence interval for the mean difference ranged from 71.225 to 79.242 pounds. The test statistic (t = -37.292, df = 89) was highly significant ($p < .001$), indicating a strong effect of the intervention (Table 2). Contrary to the hypothesis (H_1) that there is no significant relationship between bodybuilding training and weight loss, the data suggest a substantial weight reduction attributable to the training regimen. The significant negative t-value indicates a decrease in weight post-training, providing strong evidence against the null hypothesis and supporting the efficacy of bodybuilding training in promoting weight loss among the study participants. This substantial reduction in weight demonstrates the effectiveness of the bodybuilding training program, making a significant contribution to the physical health outcomes of the participants.

4.2.2. *H_2*: There is no significant relationship between the frequency of bodybuilding training (2, 3, and 5 days per week) and weight loss in the study population over the 12-week period.

A one-way ANOVA was conducted to explore if there were differences in weight loss among groups that trained at varying frequencies—2 times a week, 3 times a week, and 5 times a week—over a 12-week period (Table 3, Table 4). The analysis revealed no significant difference in weight loss among these training frequencies, $F(2, 87) = 0.791$, $p = .457$. Specifically, the mean weights post-training was 150.53 kg (SD = 16.406) for 2 times a week, 154.53 kg (SD = 17.575) for 3 times a week, and 155.43 kg (SD = 13.994) for 5 times a week. The lack of statistical significance supports the hypothesis (H_2) that the frequency of bodybuilding training does not have a significant relationship with weight loss in the study population over the examined period. This outcome suggests that increasing the frequency of training sessions per week does not necessarily enhance weight loss, indicating that other factors such as dietary habits, training intensity, or individual metabolic differences might play more significant roles in influencing weight loss outcomes.

4.2.3. *H_3*: There is no significant relationship between bodybuilding training and BMI improvement in the study population over the 12-week period.

The paired samples t-test was conducted to assess the impact of bodybuilding training on BMI reduction over a 12-week period. The results revealed a significant decrease in BMI from the pre-test (M = 28.40, SD = 1.00) to the post-test (M = 21.612, SD = 1.77), with a mean difference of 6.79 (SD = 1.94, SE = 0.20). The 95% confidence interval for the mean difference ranged from 6.38 to 11.16. The test statistic (t = 33.26, df = 89) was highly significant ($p < .001$), indicating a strong effect of the intervention. Contrary to the hypothesis (H_3) that there is no significant relationship between bodybuilding training and BMI improvement (Table 5). The data strongly suggest a substantial reduction in BMI attributable to the training regimen. The significant positive t-value indicates a robust decrease in BMI post-training, providing solid evidence against the null hypothesis and supporting the efficacy of bodybuilding training in promoting BMI improvement among the study participants. This significant improvement in BMI underscores the effectiveness of the bodybuilding training program, significantly contributing to the health outcomes of the participants.

4.2.4. *H_4*: There is no significant relationship between bodybuilding training frequency (2, 3, and 5 days per week) and improvement in BMI over the 12-week period.

A one-way ANOVA was performed to evaluate the impact of bodybuilding training frequency (2, 3, and 5 days per week) on BMI improvement over a 12-week period (Table 6, Table 7). The analysis indicated no significant differences in BMI changes across the three training frequencies, $F(2, 87) = 0.051$, $p = .950$. The mean BMI values were relatively similar across the groups: 21.680 (SD = 1.8292) for 2 times a week, 21.623 (SD = 1.9242) for 3 times a week, and 21.533 (SD = 1.6225) for 5 times a week. The lack of significant findings supports the hypothesis (H4) that there is no substantial relationship between the frequency of bodybuilding training and improvements in BMI. This outcome suggests that the number of days participants engaged in bodybuilding training did not influence the effectiveness of their programs in terms of BMI

reduction. This implies that factors other than training frequency might be more influential in affecting BMI changes, such as diet, exercise intensity, or individual metabolic responses.

4.2.5. *H_5:* There is no significant association between the regularity of bodybuilding training and body fat reduction outcomes (weight loss, body shape improvement, physical fitness improvement, enhancement in psychological well-being).

Weight Loss Outcome: H_{5a}: There is no significant association between the regularity of bodybuilding training and body fat reduction outcomes (weight loss).

To evaluate this hypothesis, first, a simple linear regression analysis was performed with weight loss reduction as the dependent variable and the regularity of bodybuilding training as the independent variable.

As indicated in the regression output, the R2R^2R2 value of 0.351 suggests that approximately 35.1% of the variance in weight loss reduction is explained by the regularity of bodybuilding training, which is statistically significant with F(1,88)=47.577,p<0.001. Despite the initial hypothesis (H5) suggesting no significant association, the regression coefficients and significant P-values suggest a substantial association between the regularity of bodybuilding training and weight loss outcomes, showing a positive correlation ($\beta = 0.592$, $p < 0.001$) (Table 8). This indicates an increase in weight loss among individuals with regular bodybuilding training

In the Normal P-P Plot of Regression Standardized Residuals, the observed cumulative probabilities closely align with the expected values if the residuals were normally distributed (Figure 2). This alignment suggests that the residuals from the regression model, which evaluates the effectiveness of regular bodybuilding training on weight loss reduction, are normally distributed. The close adherence to the diagonal line in this plot indicates that the assumption of normality, which is crucial for the linear regression analysis, is reasonably met. This finding supports the validity of the regression model's inferences about the relationship between bodybuilding training regularity and weight loss outcomes.

Body Shape Improvement: H_{5b}: There is no significant association between the regularity of bodybuilding training and fat reduction outcomes (body shape improvement).

To test this hypothesis, a simple linear regression was performed with body shape improvement as the dependent variable and the regularity of bodybuilding training as the independent variable.

The regression output reveals an R^2 value of 0.132, indicating that approximately 13.2% of the variance in body shape improvement is explained by the regularity of bodybuilding training. This association is statistically significant with F(1,88)=13.406, p<0.001. Despite the initial hypothesis suggesting no significant association, the regression coefficients and significant P-values imply a modest yet significant association between the regularity of bodybuilding training and body shape improvement outcomes. This positive correlation ($\beta = 0.364$, $p < 0.001$) suggests an improvement in body shape among individuals who engage regularly in bodybuilding training (Table 9).

In the Normal P-P Plot of Regression Standardized Residuals, the observed cumulative probabilities closely align with the expected values if the residuals were normally distributed (Figure 3). This alignment suggests that the residuals from the regression model, which evaluates the effectiveness of regular bodybuilding training on body shape improvement, are normally distributed. The close adherence to the diagonal line in this plot indicates that the assumption of normality, crucial for the linear regression analysis, is reasonably met. This finding supports the validity of the regression model's inferences about the relationship between bodybuilding training regularity and improvements in body shape.

***Physical Fitness Improvement: H_{5c}:* There is no significant association between the regularity of bodybuilding training and fat reduction outcomes (physical fitness improvement).**

To test this hypothesis, a simple linear regression was conducted with physical fitness improvement as the dependent variable and the regularity of bodybuilding training as the independent variable. The regression output reveals an R2R^2R2 value of 0.127, indicating that approximately 12.7% of the variance in physical fitness improvement is explained by the regularity of bodybuilding training. This association is statistically significant with $F(1,88) = 12.786$, $p = 0.001$. Despite the initial hypothesis suggesting no significant association, the regression coefficients and significant P-values imply a modest yet significant association between the regularity of bodybuilding training and physical fitness improvement. This positive correlation ($\beta = 0.356$, $p = 0.001$) suggests an improvement in physical fitness among individuals who engage regularly in bodybuilding training (Table 10).

In the Normal P-P Plot of Regression Standardized Residuals, the observed cumulative probabilities closely align with the expected values if the residuals were normally distributed (Figure 4). This alignment suggests that the residuals from the regression model, which evaluates the effectiveness of regular bodybuilding training on physical fitness improvement, are normally distributed. The close adherence to the diagonal line in this plot indicates that the assumption of normality, crucial for the linear regression analysis, is reasonably met. This finding supports the validity of the regression model's inferences about the relationship between bodybuilding training regularity and improvements in physical fitness.

***Enhancement In Psychological Well-Being: H_{5d}:* There is no significant association between the regularity of bodybuilding training and enhancement in fat reduction outcomes (psychological well-being).**

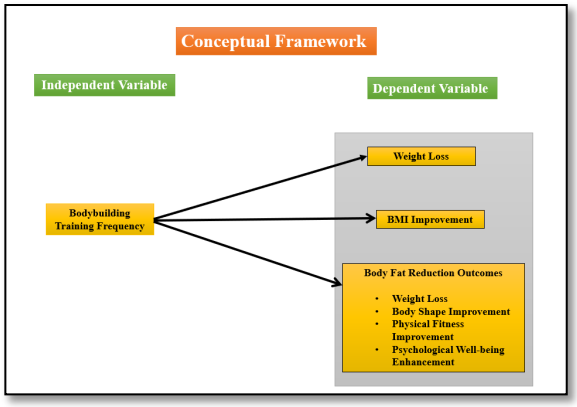

Figure 1. Conceptual Framework for this Study (Source: Self-generated)

Table 1. Demographic information about Participants

Factor	Attribute	Frequency	Percent %	Mean	Standard Deviation
Age	Under 18	1	1.1	2.79	0.71
	18-24	31	34.4		
	25-34	44	48.9		
	35-44	14	15.6		
	Total	90	100.0		
Gender	Male	60	66.7	1.33	0.47
	Female	30	33.3		
	Total	90	100.0		
Overall Health Perception	Very Good	13	14.4	3.10	0.62
	Good	55	61.1		
	Fair	22	24.4		
	Total	90	100.0		
Pre-existing medical conditions	Definitely Not	13	14.4	2.20	0.72
	Probably Not	49	54.4		
	May or May Not	25	27.8		
	Probably Yes	3	3.3		
	Total	90	100		

Table 2. Paired Samples Test for Pre-test and Post-test Weight Change

	Mean Pre-test Weight (lb)	Mean Post-test Weight (lb)	Mean Difference	Std. Deviation	Std. Error Mean	95% CI Lower	95% CI Upper	t-value	df	p-value (2-tailed)
Weight Change	228.73	153.50	75.233	19.139	2.017	71.225	79.242	-37.292	89	.000

Table 3. One-Way ANOVA Analysis of Weight Loss by Frequency of Bodybuilding Training

Frequency of Training	N	Mean Weight (Lb)	Std. Deviation	95% CI Lower Bound	95% CI Upper Bound
2 times a week	30	150.53	16.406	144.41	156.66
3 times a week	30	154.53	17.575	147.97	161.10
5 times a week	30	155.43	13.994	150.21	160.66

Table 5. Paired Samples Test for Pre-test and Post-test BMI Change

	Mean Pre-test BMI	Mean Post-test BMI	Mean Difference	Std. Deviation	Std. Error Mean	95% CI Lower	95% CI Upper	t-value	df	p-value (2-tailed)
BMI Change	28.40	21.612	6.79	1.94	.20	06.38	11.16	33.26	89	.000

Table 4. ANOVA Results of Weight Loss by Frequency of Bodybuilding Training

Source of Variation	Sum of Squares	df	Mean Square	F-value	p-value
Between Groups	408.200	2	204.100	0.791	.457
Within Groups	22442.300	87	257.957		
Total	22850.500	89			

Table 6. Descriptives for BMI Based on Training Frequency

Training Frequency	N	Mean BMI	Std. Deviation	95% CI Lower Bound	95% CI Upper Bound
2 times a week	30	21.680	1.8292	20.997	22.363
3 times a week	30	21.623	1.9242	20.905	22.342
5 times a week	30	21.533	1.6225	20.927	22.139

Table 7. ANOVA for BMI Based on Training Frequency

Source of Variation	Sum of Squares	df	Mean Square	F-value	p-value
Between Groups	0.328	2	0.164	0.051	.950
Within Groups	280.748	87	3.227		
Total	281.077	89			

Table 8. Regression Coefficients of Bodybuilding Training Regularity on the Effectiveness of Training in Reducing Body Weight (Source: SPSS Data Illustration)

Variables	B	SE	t	p	95.0% CI
Constant	1.123	0.398	2.822	.006	[0.332, 1.914]
Bodybuilding training Performance	0.655	0.095	6.898	.000	[0.466, 0.843]

Note. B = Unstandardized B coefficient, SE = Standard Error, t = t-Statistic, CI = Confidence Interval

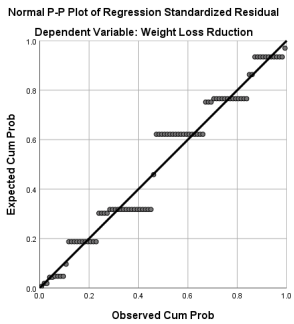

Figure 2. The Normal P-P Plot of Regression Standardized Residual for the dependent variable Weight Loss Reduction and the independent variable Bodybuilding Training Performance (Source: SPSS data illustration).

Table 9. Regression Coefficients of Bodybuilding Training Regularity on the Effectiveness of Training in Improving Body Shape (Source: SPSS Data Illustration)

Variables	B	SE	t	p	95.0% CI
Constant	1.986	0.449	4.427	.000	[1.095, 2.878]
Bodybuilding Training Performance	0.392	0.107	3.661	.000	[0.179, 0.605]

Note. B = Unstandardized B coefficient, SE = Standard Error, t = t-Statistic, CI = Confidence Interva

Table 10. Regression Coefficients of Bodybuilding Training Regularity on the Effectiveness of Training in Improving Physical Fitness (Source: SPSS Data Illustration)

Variables	B	SE	t	p	95.0% CI
Constant	2.292	0.455	5.039	.000	[1.388, 3.196]
Bodybuilding Training Performance	0.388	0.108	3.576	.001	[0.172, 0.603]

Note. B = Unstandardized B coefficient, SE = Standard Error, t = t-Statistic, CI = Confidence Interval

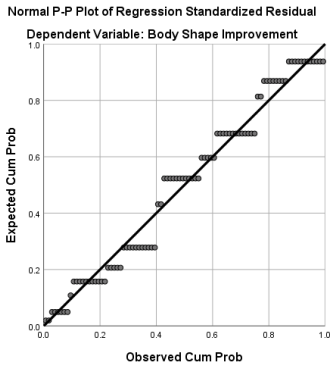

Figure 3. The Normal P-P Plot of Regression Standardized Residual for the dependent variable Body Shape Improvement and the independent variable Bodybuilding Training Performance (Source: SPSS data illustration).

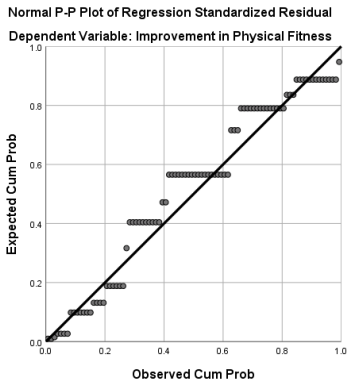

Figure 4. The Normal P-P Plot of Regression Standardized Residual for the dependent variable Improvement in Physical Fitness and the independent variable Bodybuilding Training Performance (Source: SPSS data illustration).

Table 11. Regression Coefficients of Bodybuilding Training Regularity on the Effectiveness of Training in Enhancing Psychological Well-Being (Source: SPSS Data Illustration)

Variables	B	SE	t	p	95.0% CI
Constant	2.595	0.430	6.035	.000	[1.740, 3.449]
Bodybuilding Training Performance	0.257	0.103	2.504	.014	[0.053, 0.461]

Note. B = Unstandardized B coefficient, SE = Standard Error, t = t-Statistic, CI = Confidence Interval

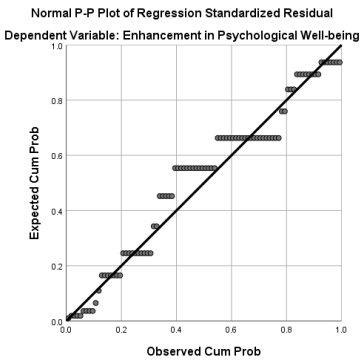

Figure 5. The Normal P-P Plot of Regression Standardized Residual for the dependent variable Enhancement in Psychological Well-being and the independent variable Bodybuilding Training Performance (Source: SPSS data illustration).

To test this hypothesis, a simple linear regression was conducted with enhancement in psychological well-being as the dependent variable and the regularity of bodybuilding training as the independent variable.

The regression output reveals an R2R^2R2 value of 0.066, indicating that approximately 6.6% of the variance in psychological well-being is explained by the regularity of bodybuilding training. This association is statistically significant with $F(1,88)=6.269, p=0.014$. Despite the initial hypothesis suggesting no significant association, the regression coefficients and significant p-values imply a modest yet significant association between the regularity of bodybuilding training and enhancement in psychological well-being. This positive correlation ($\beta = 0.258$, $p = 0.014$) suggests a mild improvement in psychological well-being among individuals who engage regularly in bodybuilding training (Table 11).

In the Normal P-P Plot of Regression Standardized Residuals, the observed cumulative probabilities closely align with the expected values if the residuals were normally distributed (Figure 5). This alignment suggests that the residuals from the regression model, which evaluates the effectiveness of regular bodybuilding training on enhancing psychological well-being, are normally distributed. The close adherence to the diagonal line in this plot indicates that the assumption of normality, crucial for the linear regression analysis, is reasonably met. This finding supports the validity of the regression model's inferences about the relationship between bodybuilding training regularity and improvements in psychological well-being.

5. Discussion

5.1. Impact of Bodybuilding Training on Weight Loss Over 12 Weeks

According to the results of this study, the subjects who completed the bodybuilding training for twelve weeks lost significant weight, and therefore the null hypothesis which predicted no significant relationship between bodybuilding training and weight loss was rejected. The foregoing findings are in line with other published literature. For example, studies related to elite bodybuilders indicated that both conventional and modern diets for weight loss were effective though the latter was seen to be more effective in preserving muscle mass better (Kim & Kim, 2023). Another study found competitive natural bodybuilders reported marked weight loss during the contest preparation phases(Lalu & DellaValle, 2018). Furthermore, a study carried out on amateur bodybuilders also showed that body mass is reduced due to training and diet regimes (Lupu, 2021). The possible causes for such results may stem from performing high-intensity bodybuilding training accompanied by a meticulously planned diet that is credited for reducing fat mass while retaining fat-free mass (Barakat et al., 2020). Moreover, the structure of bodybuilding training programs incorporates energy restriction and training progression can also help to reduce body weight (Ribeiro et al., 2019). Thus, this research successfully confirms that bodybuilding training is effective for witnessing a considerable amount of weight loss.

5.2. Effect of Training Frequency on Weight Loss Among Overweight Participants

According to this work, there were no notable differences in the weight loss in the bodybuilders when they trained more frequently (2, 3, or 5 days per week). The same has been observed in various other studies done in different areas. In this regard, a meta-analysis study by Ralston et al. (2018) showed that training frequency does not have any influence on the increase in muscular strength if training volume is controlled. Research on the frequency of bodybuilding training also revealed that there were no statistical differences in the changes in body composition across different exercise frequencies (Franco et al., 2021). Further, the studies of older people demonstrated that the higher training volume could not bring an enhanced effect size in strength or body composition (Turpela et al., 2017). The possible explanations for these results might include the fact that the total amount and level, but not the frequency of the training, are the most important factors when it comes to the effectiveness of weight loss. Also, the personal variations in metabolism and the choice of nutrition may be considerably more influential than the number of training sessions (Colquhoun et al., 2018). Thus, based on these findings, the current study concluded that the number of bodybuilding training per week has little influence on weight loss as validated by the training volume.

5.3. Relationship Between Bodybuilding and BMI Improvement

The results of this study established a decrease in BMI among the participants after a 12-week bodybuilding training program implementation. These trends can also be seen in other studies done by various other researchers. For example, according to research, bodybuilding training offered a decrease in body mass index and the percentage of body fat among overweight female students (Aboshkair et al., 2023). In another study, it was also shown that bodybuilding training with a proper maintaining diet significantly enhanced body composition especially in the BMI of the elderly population(Liao et al., 2017). Furthermore, a randomized controlled trial concluded that both high-intensity interval training led to a reduction in BMI among overweight women (Cervantes & Hernández, 2017). The possible explanations for these results may lie in the very fact that bodybuilding usually involves well-scheduled routines that include both strength training and controlled energy intake, which results in extensive lean tissue mass and fat reduction. Furthermore, metabolic demands, especially on bodybuilding exercises, may provoke greater metabolic adjustments that improve fat metabolism and overall body

adaptability (Liu et al., 2019). Consequently, this study supports the prior literature by emphasizing the efficacy of structured bodybuilding training in the reduction of BMI and enhancement of body composition.

5.4. Influence of Training Frequency on BMI Changes among Overweight Participants

This study did not show any correlation between the frequency of bodybuilding training (2, 3, and 5 days a week) with the changes in BMI after 12 weeks of training. This result has also been reported in other similar studies. For instance, a study looking at the effects of various bodybuilding training frequencies on overweight male subjects established that the alteration in frequency of high-intensity interval training had no bearing on the BMI or body fat loss, which suggested that overall training volumes might dictate the outcome (Chin et al., 2019). In another study, bodybuilding training with different frequencies did not show the alterations in the BMI of older people recommending that the overall training efficiency and volume are crucial characteristics (Alves et al., 2019). Furthermore, the review also revealed that in overweight female students the training frequency does not influence their BMI and therefore such component as diet and training intensity could be more crucial (Aboshkair et al., 2023). Some of the reasons that could have made it possible to achieve such result may be the strength and quality of the exercise regimes and not the number of the sessions. Furthermore, it suggests that the variability in basal metabolism and adherence to dietary guidelines among individuals might result in changes in BMI to a larger degree than the number of training sessions (Foulis et al., 2023). Hence, due to the findings of this study it can be argued that the number of bodybuilding training sessions has a weak relationship with daily BMI change, thereby low relationship and therefore other variables such as training intensity, volume and diet must also have roles.

5.5. Association Between Training Regularity and Body Fat Reduction Outcomes

The purpose of this research was to analyze the correlation between the frequency of bodybuilding training sessions and the effectiveness of body fat loss intervention in the four mentioned areas including weight loss, body shape transformation, and physical and mental health enhanced levels. Regarding weight loss, the analysis showed that bodybuilding training has a direct positive correlation with the weight loss effect, which is a great indication of fat loss. Regarding body shape improvement, survey output proved that bodybuilding training helped to lose their body fat, which in turn improved their body shape. Moreover, physical fitness improvement was also recorded whereby respondents who engaged in regular bodybuilding training witnessed an improvement in physical fitness indicating that training improves physical fitness due to fat loss. In addition, regarding psychological well-being, it was found that bodybuilding training reduced body fat, which in turn enhanced psychological well-being. Thus, the practice of bodybuilding training is related to an increase in mental health.

The same has been noted in other related research studies carried out in the past. For instance, a study clearly showed that moderate bodybuilding helped in clearly in decreasing the body weight and fat mass of overweight adults (Petridou et al., 2019). Positive changes in body shape and body composition were also described in another study in relation to daily bodybuilding training that helped to decrease the amount of abdominal fat (Zouhal et al., 2020). Studies have also suggested that bodybuilding helps enhance physical fitness as well as cardio-pulmonary fitness in overweight persons and thereby enhances the inhabitants' well-being (Karami et al., 2020). In addition, psychological factors such as less anxiety and better self-esteem that result from bodybuilding have also been proven (Hu et al., 2022).

The probable causes of fat reduction involve both acute and accretion processes of frequent training on energy expenses resulting in improved fat catabolism and maintaining muscle mass (Zouhal et al., 2020). Besides, psychological improvement noticed could be enhanced neurobiological changes that come with bodybuilding, including endorphin release and cognitive advancements (Basso et al., 2022). Moreover, bodybuilding has also been proven to enhance the positive construct of self-image and decrease stress, leading to the improvement of mental health (Giurgiu & Hanțiu, 2020). Thus, this study provides evidence for the statement that the regularity of bodybuilding training has positive effects on weight loss, body shape, and physical and psychological well-being, stressing the significance of regular training to achieve higher effects.

6. Conclusion

The research findings demonstrated that bodybuilding training significantly impacts weight loss and body mass index (BMI) over a 12-week period. While the frequency of training sessions is correlated with changes in weight, body composition, fitness, and mental health, the specific frequency—whether 2, 3, or 5 days per week—did not directly influence weight loss or BMI outcomes. This suggests that factors beyond training frequency, such as perceived frequency, intensity, and individual participant variables, play a crucial role in these changes. The results indicated a preference for consistent engagement in bodybuilding rather than merely increasing the number of training days, emphasizing the benefits of a holistic and continuous approach.

A limitation of this study is its cross-sectional design, which captures only a snapshot of data at a single point in time, rather than tracking changes longitudinally. This approach may overlook effects occurring outside the specified time frame and fail to account for variations in participants' behaviors over an extended period. Additionally, data collected through online surveys may

introduce biases or inaccuracies. The study's sample size of 90 participants further restricts the generalizability of the results. It also did not control for other influential factors such as diet, sleep, and variations in the frequency and intensity of bodybuilding training. Moreover, the use of purposive sampling may have introduced sample bias, limiting diversity and, consequently, the generalizability of findings. These limitations should be considered when interpreting the results.

Future research should adopt a longitudinal design to quantify the long-term effects of bodybuilding training on weight and BMI. This approach would offer insights into how different training programs affect the overall health of the muscular system over time. Including a larger and more diverse sample would enhance the external validity of the study. Additionally, it is recommended to incorporate other influencing factors such as diet, sleep, and training intensity to better elucidate their effects on weight and BMI. Employing more rigorously defined methodologies, such as tracking devices instead of questionnaires, would improve the reliability of the findings. Future studies could also explore the psychological characteristics of participants and the motivational aspects of regular training in bodybuilding to understand how to maintain the observed benefits. Implementing these recommendations could significantly contribute to developing a more robust and nuanced understanding of the effectiveness of bodybuilding training for individuals with overweight.

Author contributions

W.C and S.R.M contributed to conceptualization, fieldwork, data analysis, drafting the original manuscript, editing, funding acquisition, and manuscript review. Both W.C and S.R.M were involved in research design, methodology validation, data analysis, visualization, and manuscript review and editing. Additionally, W.C took the lead in methodology validation, investigation, funding acquisition, supervision, and final revisions. All authors have reviewed and approved the final version of the manuscript.

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Competing financial interests

The authors have no conflict of interest.

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