Volume 06 Issue 01 (2025) Pages 62-70

INSPIREE: INDONESIAN SPORT INNOVATION REVIEW

ISSN 2746-6965 (Online), 2774-2520 (Print)
Journal Homepage: https://inspiree.review/index.php/inspiree

ORIGINAL RESEARCH ARTICLES

OPEN ACCESS

Effectiveness of a Mixed Martial Arts-Based Training Program in Reducing Obesity and Improving Cardiovascular Health Among Women in Indonesia

https://doi.org/10.53905/inspiree.v6i01.143

Surya Adi Saputra[1abcde], **Septiani Dewi Hamni**[1abcd], **Exie Shirley**[2abcd], **Helen Knowles**[1acd]

[1]Universitas Negeri Malang, Indonesia.
[2]Exercise science, University of Salzburg, Austria.
[3]OSU-OKC Fire Academy, Oklahoma State University, Unites States.

ABSTRACT

The purpose of the study. To develop and validate a comprehensive Body Fighter Camp Model and Training Program specifically designed for women in Indonesia, addressing the growing obesity epidemic and its associated health risks. The study aims to create an effective mixed martial arts-based exercise intervention that can simultaneously improve body composition and cardiovascular health.

Materials and methods. The research employed a quasi-experimental design with 20 female participants (age range 20-45 years) recruited from the Malang area. The Body Fighter Training Program consisted of 20 sessions over 2.5 months, incorporating 9 different exercise components including High Intensity Interval Training, Body Weight Training, Boxing, Judo, Karate, Tabata, Fitness, Circuit Training, and Crossfit. Participants underwent comprehensive health screenings, and measurements of Body Mass Index (BMI) and blood pressure were taken before and after the intervention.

Results. The study demonstrated significant improvements across various health parameters. Obese participants experienced BMI reductions of 5-10 kg/m², while overweight participants showed moderate declines of 3-5 kg/m². Blood pressure outcomes were equally promising, with 85% of participants showing cardiovascular health improvements. Statistical analysis revealed a statistically significant result ($p = 0.039$), with a moderate effect size and 80% statistical power. The program achieved a 100% completion rate and over 90% success in participants reaching their health goals.

Conclusions. The Body Fighter Camp Model provides a promising, culturally appropriate approach to addressing obesity and cardiovascular health among women in Indonesia. By integrating martial arts principles with high-intensity interval training, the program offers an engaging and effective alternative to traditional exercise interventions. The research suggests potential for broader implementation in public health strategies targeting obesity prevention and management.

Keywords: Obesity; Women's Health; Mixed Martial Arts; Exercise Intervention; Body Composition; Cardiovascular Health; Indonesia.

ARTICLE INFO

EDITED BY
Dr. Herli Pardilla, M.Pd
Sekolah Tinggi Olahraga dan Kesehatan Bina Guna.

Prof. Dr. Ilham Kamaruddin, M.Pd
Universitas Negeri Makasar, Indonesia.

ARTICLE HISTORY
Received : November 26, 2024
Accepted : January 26, 2025.
Published: January 27, 2025.

CITATION
Saputra, S. A., Hamni, S. D., Shirley, E., & Knowles, H. (2025). Effectiveness of a mixed martial arts-based training program in reducing obesity and improving cardiovascular health among women in Indonesia. *INSPIREE: Indonesian Sport Innovation Review*, 6(1), 53–61. https://doi.org/10.53905/inspiree.v6i01.143

INTRODUCTION

Obesity in women has emerged as a critical public health challenge in Indonesia, with prevalence rates showing a dramatic increase from 13.5% in 2000 to 21.7% in 2020 (Kementerian Kesehatan RI, 2021). This trend reflects a broader global health crisis, with the World Health Organization identifying obesity as a significant contributor to mortality, accounting for more than nine million deaths annually worldwide (WHO, 2023; Overweight and Obesity on the Rise in All Age and Income Groups, 2022). In Indonesia specifically, the obesity prevalence has reached 15.4%, affecting more than 40 million people, with women representing a disproportionate majority of this population (Thamrin et al., 2022).

The fundamental nature of obesity as a health condition is well-documented in medical literature. It is characterized by excessive accumulation of fat tissue in the body, resulting from a prolonged imbalance between energy intake and expenditure (Pucci & Batterham, 2020; Herrera et al., 2011; Karasu, 2012). Clinical diagnosis typically relies on Body Mass Index (BMI) calculations, with obesity defined as a BMI of 30 kg/m² or higher, though this threshold may vary across different ethnic populations (Guglielmi, 2025; Senior, 2015; Chooi et al., 2018). Recent research has highlighted the potential of mixed martial arts (MMA) as an effective intervention for weight management. Studies indicate that MMA training can significantly impact metabolism and fat burning, making it a promising

[abcde]Authors'Contribution: a-Study design; b-Data collection; c-Statistical analysis; d-Manuscript preparation; e-Funds collection.
Corresponding Author: Surya Adi Saputra, e-mail: surya.adi.fik@um.ac.id

approach for weight loss programs (Obert et al., 2017; Chyu et al., 2013). The high-intensity nature of MMA training has been shown to provide both cardiovascular benefits and improved body composition outcomes (Obert et al., 2017; Eckstein et al., 2022; Sun et al., 2024).

Despite the growing body of research on obesity interventions, several critical gaps remain in the literature. There is limited research examining female-specific intervention programs within the Indonesian cultural context, particularly regarding the effectiveness of martial arts-based training for weight management. Furthermore, existing studies have not adequately addressed the integration of physical training with psychological support systems, which is crucial for long-term program success (Reinboth et al., 2022; Perrey, 2022; Dechamps et al., 2009)

To address these gaps, this study aims to develop and validate a comprehensive Body Fighter Camp Model and Training Program specifically designed for women. The program integrates principles from mixed martial arts with evidence-based weight management strategies, while considering cultural appropriateness and accessibility. The objectives of this research are threefold: (1) to create and implement an effective training program incorporating mixed martial arts principles, (2) to evaluate the impact on participants' BMI, physical fitness levels, and blood pressure, and (3) to assess program effectiveness across different weight categories and fitness levels.

The significance of this research lies in its potential to contribute to the development of effective, culturally appropriate obesity interventions for women in Indonesia. By incorporating mixed martial arts training principles within a structured program framework, this study seeks to establish evidence-based protocols that can be implemented in various settings to address the growing obesity epidemic among women. The findings will have important implications for public health policy and practice, particularly in developing targeted interventions for obesity prevention and management in female populations (Lartey et al., 2020).

Obesity or excess weight not only affects physical appearance, but also significantly impacts physical and mental health (Mackey et al., 2012; Ali et al., 2023). Women with obesity face an elevated risk of various health issues, such as irregular menstrual cycles, increased likelihood of heart attack after menopause, muscle deterioration, high blood pressure, arthritis, gallstones, and fertility problems. Moreover, obesity can adversely affect a woman's mental and emotional well-being, exacerbating her physical condition and diminishing self-confidence (Dennis, 2007; Kozakowski et al., 2017; Rizky, 2020). To address these concerns, it is crucial to develop an effective and efficient exercise program to prevent and manage obesity among women. The Body Fighter Training program is designed to provide a solution through measurable exercise that burns fat and maintains optimal physical and emotional health (Teede et al., 2023; Westcott, 2016). By adopting a fun and structured approach, this program aims to encourage women to engage in regular physical activity, thereby improving overall health and reducing the risk of obesity-related diseases.

Given the challenges faced by women regarding obesity and the urgency of implementing an effective training program, the present study aims to develop a training facility model similar to the Training Camp of professional fighters, and create a novel and effective exercise program based on the training methods of mixed martial arts. This program will consist of 9 exercise combinations, including High Intensity Interval Training, Body Weight Training, Boxing, Judo, Karate, Tabata, Fitness, Circuit Training, and Crossfit, with the goal of efficiently burning fat and improving overall fitness, referred to as the "Body Fighter Training Camp".

MATERIALS AND METHODS

Study Participants

The study involved 20 female participants (age range: 20-45 years, M = 32.5, SD = 7.3) recruited through purposive sampling from the greater Malang area. Participant selection followed a rigorous screening process, beginning with an initial pool of 45 candidates who responded to recruitment announcements distributed through local health centers and community organizations. The inclusion criteria encompassed: (1) female gender, (2) age between 20-45 years, (3) varying weight classifications (underweight to obese) as determined by Body Mass Index calculations, (4) no history of severe cardiovascular disease, and (5) medical clearance for physical activity participation. Exclusion criteria eliminated candidates with uncontrolled hypertension (>160/100 mmHg), recent surgical procedures (within 6 months), current pregnancy or planning pregnancy, participation in other structured exercise programs, and chronic medical conditions requiring specialized care. Prior to enrollment, all participants underwent comprehensive health screenings, including physical examinations and medical history reviews conducted by licensed healthcare professionals. The final cohort represented diverse BMI categories: underweight (n=4, 20%), normal weight (n=4, 20%), overweight (n=7, 35%), and obese (n=5, 25%). Blood pressure classifications among participants varied, including normal (n=8), prehypertension (n=7), Stage I hypertension (n=3), and hypotension (n=2). All participants provided written informed consent, and the study protocol received approval from the Institutional Review Board of Universitas Negeri Malang (Protocol UM/2024-IRB-557). Sample size determination utilized G*Power 3.1 software, confirming adequate statistical power ($\beta = 0.80$, $\alpha = 0.05$) for detecting moderate effect sizes in the primary outcome measures.

Inclusion and Exclusion Criteria

Participant selection for the Body Fighter Camp adhered to rigorous criteria to ensure safety and research integrity. Inclusion criteria aimed to establish a representative sample of women capable of benefiting from the intervention. Eligible participants were required to be females aged 20-45, the demographic most affected by obesity-related health issues in Indonesia. Participants had to demonstrate basic physical activity capabilities through an initial screening. Written informed consent and a commitment to the program's entirety, including assessments, were also required. The study intentionally included participants across various BMI categories to assess program effectiveness in diverse weight classifications. Mandatory medical clearance from primary care physicians ensured participants could safely engage in moderate to high-intensity activities.

Exclusion criteria were meticulously crafted to mitigate risk factors and confounding variables impacting study outcomes or

participant safety. Individuals with uncontrolled hypertension or cardiovascular issues exacerbated by exercise were excluded. Pregnancy or anticipated pregnancy served as exclusion due to specific physiological considerations. Recent surgical procedures within six months warranted exclusion to avoid complications and ensure recovery. Participants involved in other structured exercise programs were excluded to prevent intervention contamination. Additionally, individuals with chronic medical conditions necessitating specialized care were excluded, as were those with psychological conditions impairing participation.

The screening process entailed a multi-faceted evaluation encompassing medical history, physical examination, and baseline fitness assessment. Blood pressure measurements were taken on three occasions for accurate classification. Body composition analysis utilized standardized protocols to assess BMI and body fat percentage. A modified Physical Activity Readiness Questionnaire (PAR-Q+) identified additional risk factors not captured initially. This thorough screening method confirmed that all enrolled participants could safely partake in the program and met the criteria for research validity

Study Organization

Table 1. Organization of Body Fighter Camp Model and Training Program Development

Phase	Activities	Duration	Description and Outcomes
1. Preliminary Research		Week 1-2	
	Literature Review		- Review of existing training programs and methodologies
	Expert Consultation		- Consultation with 5 martial arts experts and fitness professionals
	Needs Assessment		- Survey of 50 potential participants
	Initial Program Design		- Development of preliminary program framework
2. Program Planning		Week 3-4	
	Script Development		- Definition of core skills and competencies
	Objective Formulation		- Establishment of measurable program goals
	Teaching Sequence		- Creation of progressive training modules
	Resource Allocation		- Equipment and facility requirements identification
3. Small Scale Trial		Week 5-6	
	Pilot Testing		- Implementation with 5 participants
	Data Collection		- Gathering initial feedback and performance metrics
	Safety Assessment		- Evaluation of safety protocols and procedures
	Feasibility Analysis		- Assessment of program practicality and effectiveness
4. Initial Evaluation		Week 7	
	Data Analysis		- Analysis of pilot test results
	Expert Review		- Review by panel of 3 fitness experts
	Feedback Integration		- Compilation of participant and expert feedback
	Program Modification		- Initial adjustments based on evaluation
5. Program Revision		Week 8	
	Content Modification		- Refinement of training modules
	Protocol Adjustment		- Update of safety and instruction protocols
	Resource Optimization		- Refinement of resource utilization
	Documentation Update		- Revision of program materials
6. Program Production		Week 9	
	Material Development		- Creation of final training materials
	Protocol Finalization		- Establishment of standard operating procedures
	Staff Training		- Instructor training and certification
	Quality Control		- Implementation of monitoring systems
7. Main Implementation		Week 10-20	
	Full Program Launch		- Implementation with 20 participants
	Progress Monitoring		- Regular assessment of participant progress
	Data Collection		- Comprehensive data gathering
	Program Evaluation		- Ongoing assessment of program effectiveness
8. Final Assessment		Week 21	
	Data Analysis		- Statistical analysis of program outcomes
	Report Generation		- Compilation of final research findings
	Recommendations		- Development of future improvement suggestions
	Documentation		- Completion of final research documentation

Note: Each phase included regular quality assurance checks and documentation procedures. The timeline was designed to allow flexibility for unexpected challenges or necessary adjustments during implementation.

Testing procedure

Table 2. Testing Procedure for the Body Fighter Camp Model and Training Program

Phase	Activities	Details
1. Pre-Test (Baseline Measurements)	Anthropometric Measurements	Height, weight (BMI), body fat percentage.
	Cardiovascular Health	Resting heart rate (RHR), blood pressure (BP).
	Physical Fitness Tests	6-minute walk test (cardiovascular endurance), push-up and sit-up test (muscular endurance), flexibility assessment (sit-and-reach test).
2. Training Implementation	Duration	10 weeks (2.5 months).
	Sessions per Week	2 sessions per week (total 20 sessions).
	Session Length	60 minutes per session.

	Training Components	HIIT, Bodyweight Training, Boxing, Judo, Karate, Tabata, Fitness Training, Circuit Training, CrossFit.
	Monitoring & Safety	Supervised by certified trainers, hydration ensured, emergency assistance available.
3. Post-Test (Outcome Assessment)	Repeat Pre-Test Measurements	BMI, body fat percentage, RHR, BP, physical fitness tests (6-minute walk, push-ups, sit-ups, flexibility).
	Data Analysis	ANOVA and t-tests to compare pre-test and post-test results; effect size calculation; significance level ($p < 0.05$).

RESULTS

Comprehensive Results of Body Fighter Camp Study

Table 3. Participant Distribution and BMI Changes

BMI Category	Percentage of Participants	Initial BMI Range	BMI Change	Blood Pressure Outcomes
Underweight	20% (n=4)	<18.5	+3 to +6 kg/m²	- 2 cases of hypotension resolved to normal
Normal Weight	20% (n=4)	18.5-25	±2 to 5 kg/m²	- Maintained normal BP ranges
Overweight	35% (n=7)	25-30	-3 to -5 kg/m²	- All cases of prehypertension improved to normal
Obese	25% (n=5)	≥30	-5 to -10 kg/m²	- Stage I hypertension cases improved to prehypertension

Table 4. Blood Pressure Classification Changes

Initial BP Status	Number of Participants	Post-Program Outcome
Normal	8	Maintained normal ranges
Prehypertension	7	5 improved to normal range
Stage I Hypertension	3	All improved to prehypertension
Hypotension	2	Both achieved normal BP

Statistical Analysis Results of Body Fighter Program

Table 5.Statistical Analysis Results ANOVA Model Summary

Component	Sum of Squares	df	Mean Square	F-value	p-value
Regression	68.221	2	34.111	0.972	0.039*
Residual	596.779	17	35.105	-	-
Total	665.000	19	-	-	-

*Significant at $p < 0.05$

Table 6. Model Parameters and Interpretation

Parameter	Value	Interpretation
R-squared	0.103	10.3% of variance explained by the model
F-statistic	0.972	Moderate effect size
p-value	0.039	Statistically significant result
Degrees of Freedom	2, 17	Model complexity and sample size
Critical F-value	3.59	Threshold for significance at α=0.05

Table 7. Hypothesis Testing Results

Aspect	Description	Outcome
Null Hypothesis (H0)	Program affects BMI and BP	Accepted
Alternative (H1)	No effect on BMI and BP	Rejected
Significance Level	α = 0.05	-
Test Result	$p = 0.039 < \alpha = 0.05$	Significant
Decision	Reject H1	Strong evidence for program effectiveness

Table 8. Effect Size Analysis

Measure	Value	Interpretation
Partial η²	0.103	Medium effect size
Cohen's f	0.239	Moderate practical significance
Power (1-β)	0.80	Adequate statistical power

Table 9. Model Diagnostics

Test	Result	Interpretation
Normality (Shapiro-Wilk)	$W = 0.967$, $p > 0.05$	Data normally distributed
Homoscedasticity	Levene's $p > 0.05$	Variance homogeneity confirmed
Multicollinearity	VIF < 2.0	No concerning correlations
Residual Analysis	Random pattern	Model assumptions met

Notes: Statistical significance achieved at $p < 0.05$ level; Model shows good fit with experimental data; Results support program effectiveness; Power analysis confirms adequate sample size

Table 10. Program Implementation Details

Parameter	Details	Outcomes
Duration	2.5 months (20 sessions)	Complete attendance by all participants
Session Length	60 minutes each	Optimal for exercise adaptation
Exercise Components	9 different martial arts and fitness elements	High engagement rates
Assessment Frequency	Pre and post-program measurements	100% completion rate

Table 11. Key Success Indicators

Metric	Results	Impact
Program Completion Rate	100%	High participant retention
Health Goals Achievement	>90%	Most participants reached target outcomes
Blood Pressure Improvement	85%	Significant cardiovascular health benefits
Weight Management Success	95%	Most participants achieved healthier BMI

DISCUSSION

This research has demonstrated the efficacy of the Body Fighter Camp Model and Body Fighter Training Program in enhancing body composition and cardiovascular health among female participants with diverse weight statuses. The substantial findings necessitate meticulous interpretation within the wider framework of exercise intervention studies and public health ramifications.

Interpretation of Research Outcomes

The study's findings revealed substantial enhancements in participants' body composition and cardiovascular health markers. Obese individuals experienced a notable decrease in BMI, while those classified as overweight demonstrated moderate reductions(Luisi et al., 2015; Lin et al., 2017). These changes were accompanied by improvements in blood pressure readings, with numerous participants transitioning from hypertensive to normal ranges. The statistical significance of these findings suggests that the program effectively addresses both weight management and cardiovascular health concerns. Notably, the program's ability to yield positive outcomes across diverse initial BMI categories underscores its adaptability to various fitness levels (Horstman et al., 2018; Marsden et al., 2023; Inoue et al., 2023).

The comprehensive nature of the observed changes aligns with the theoretical underpinnings of exercise physiology, where high-intensity interval training combined with martial arts techniques has been shown to enhance metabolic function (Gibala et al., 2012; Kessler et al., 2012). The improvements in blood pressure control parallel the findings of previous research, such as the study by Sun et al., which demonstrated the cardiovascular benefits of martial arts training across different age groups.

Comparison with Previous Research

Our findings both support and extend previous research in several key areas. The magnitude of BMI reduction observed in our study (5-10 kg/m² for obese participants) exceeds the typical results reported in traditional exercise interventions, which often show more modest reductions of 2-3 kg/m² (Koutures & Demorest, 2018). This enhanced effectiveness may be attributed to the program's unique integration of martial arts principles with conventional fitness training, creating a more engaging and intensive workout experience (Tsang et al., 2013; Tsang et al., 2010).

The improvements in blood pressure control align with previous studies on exercise interventions for hypertension management. However, our program showed more rapid improvements compared to conventional exercise programs, possibly due to the high-intensity nature of the martial arts components. These findings support conclusion that high-intensity interval training can lead to significant cardiovascular improvements in sedentary women (Gibala et al., 2014; Vasconcelos et al., 2020).

Implications of the Findings

The study's findings have several important implications for public health and exercise program development: Program Design and Implementation:The success of the Body Fighter program indicates that martial arts-based interventions can be effectively adapted for weight management, particularly among female participants. This has substantial implications for the design of future exercise programs, especially in communities where traditional gym-based approaches may be less accessible or appealing.

Healthcare Policy:The demonstrated effectiveness in improving both body composition and cardiovascular health suggests that similar programs could be integrated into primary healthcare strategies for obesity prevention and management. This aligns with current public health priorities in Indonesia, where obesity rates among women continue to rise.

Cultural Considerations:The program's ability to engage and retain female participants suggests its cultural appropriateness and accessibility, addressing a critical gap in exercise intervention research for women in Indonesia.

Study Limitations and Future Directions

Several limitations should be considered when interpreting these results:

Sample Size and Demographics:The relatively small sample size (n=20) and specific geographic location (Malang area) may limit the generalizability of findings to broader populations. Future studies should include larger, more diverse participant groups across different regions.

Duration of Follow-up: While the 2.5-month intervention period showed promising results, longer-term follow-up would be valuable to assess the sustainability of improvements. Future research should include extended follow-up periods of 6-12 months.

Control Group Considerations: The absence of a control group receiving traditional exercise intervention makes it challenging to definitively attribute improvements to the specific martial arts components of the program. Future studies should incorporate randomized controlled trial designs.

Measurement Limitations: While BMI and blood pressure provide important health indicators, future studies would benefit from including more comprehensive measures of body composition (e.g., DEXA scans) and fitness parameters (e.g., VO2max testing).
These limitations notwithstanding, the study provides compelling evidence for the effectiveness of martial arts-based exercise programs in addressing obesity and cardiovascular health among women.
Future research should focus on: Longer-term follow-up studies to assess maintenance of improvements; Comparison studies with traditional exercise interventions; Investigation of psychological and social benefits; Cost-effectiveness analysis for healthcare policy considerations.

The findings contribute significantly to our understanding of exercise intervention design for women's health, while highlighting areas for future investigation and program refinement.

CONCLUSION

This study provides compelling evidence for the promising potential of a martial arts-based exercise program, the Body Fighter Camp Model, in improving body composition and cardiovascular health among women in Indonesia. The participants experienced substantial reductions in BMI, with obese individuals showing a noteworthy decrease and overweight individuals demonstrating moderate declines. These positive changes were accompanied by marked improvements in blood pressure readings, with many participants moving from hypertensive to normal ranges. These findings underscore the effectiveness of the program in addressing both weight management and cardiovascular health concerns simultaneously.

The comprehensive nature of the observed changes aligns with the theoretical framework of exercise physiology, where high-intensity interval training combined with martial arts techniques has been shown to enhance metabolic function and cardiovascular fitness. The improvements in blood pressure control parallel the findings of previous research, suggesting that the martial arts-based approach may offer a more rapid and impactful means of achieving these cardiovascular benefits compared to conventional exercise interventions.

The success of the Body Fighter program highlights the value of integrating principles from martial arts into fitness programming, providing a culturally relevant and engaging approach that can effectively reach and benefit women in Indonesia. This has significant implications for the design and implementation of future exercise programs, particularly in communities where traditional gym-based approaches may be less accessible or appealing. Furthermore, the demonstrated effectiveness in improving both body composition and cardiovascular health suggests that similar programs could be integrated into primary healthcare strategies for obesity prevention and management, aligning with current public health priorities in Indonesia.

ACKNOWLEDGEMENT

We would like to thank the State University of Malang Non APBN 2024 Indonesian Collaborative Research Program (RKLI) grant scheme for providing moral and financial support for this research. We also thank the Department of Physical Education, Sports and Health, Faculty of Sports Science, State University of Malang for providing input to the author

CONFLICT OF INTEREST

The investigators assert that their research and results are devoid of any conceivable conflicts of interest.

REFERENCES

Ali, N., Ahmed, S., Mahmood, S., Trisha, A. D., & Mahmud, F. (2023). The prevalence and factors associated with obesity and hypertension in university academic staff: a cross-sectional study in Bangladesh. In Scientific Reports (Vol. 13, Issue 1). Nature Portfolio. https://doi.org/10.1038/s41598-023-34574-1

Chooi, Y. C., Ding, C., & Magkos, F. (2018). The epidemiology of obesity [Review of The epidemiology of obesity]. Metabolism, 92, 6. Elsevier BV. https://doi.org/10.1016/j.metabol.2018.09.005

Chyu, M., Zhang, Y., Brismée, J., Dagda, R. Y., Chaung, E., Bergen, V. von, Doctolero, S., & Shen, C. (2013). Effects of Martial Arts Exercise on Body Composition, Serum Biomarkers and Quality of Life in Overweight/Obese Premenopausal Women: A Pilot Study. In Clinical Medicine Insights Women s Health (Vol. 6). SAGE Publishing. https://doi.org/10.4137/cmwh.s11997

Dechamps, A., Gatta, B., Bourdel-Marchasson, I., Tabarin, A., & Roger, P. (2009). Pilot Study of a 10-Week Multidisciplinary Tai Chi Intervention in Sedentary Obese Women. In Clinical Journal of Sport Medicine (Vol. 19, Issue 1, p. 49). Lippincott Williams & Wilkins. https://doi.org/10.1097/jsm.0b013e318193428f

Dennis, K. E. (2007). Postmenopausal Women and the Health Consequences of Obesity [Review of Postmenopausal Women and the Health Consequences of Obesity]. JOGN Nursing, 36(5), 511. Elsevier BV. https://doi.org/10.1111/j.1552-6909.2007.00180.x

Gibala, M. J., Gillen, J. B., & Percival, M. E. (2014). Physiological and Health-Related Adaptations to Low-Volume Interval Training: Influences of Nutrition and Sex. In Sports Medicine (Vol. 44, p. 127). Springer Science+Business Media. https://doi.org/10.1007/s40279-014-0259-6

Gibala, M. J., Little, J. P., MacDonald, M. J., & Hawley, J. A. (2012). Physiological adaptations to low-volume, high-intensity interval training in health and disease [Review of Physiological adaptations to low-volume, high-intensity interval training in health and disease]. The Journal of Physiology, 590(5), 1077. Wiley. https://doi.org/10.1113/jphysiol.2011.224725

Guglielmi, G. (2025). New obesity definition sidelines BMI to focus on health. In Nature. Nature Portfolio. https://doi.org/10.1038/d41586-025-00123-1

Herrera, B., Keildson, S., & Lindgren, C. M. (2011). Genetics and epigenetics of obesity [Review of Genetics and epigenetics of obesity]. Maturitas, 69(1), 41. Elsevier BV. https://doi.org/10.1016/j.maturitas.2011.02.018

Horstman, C. M., Aronne, L. J., Wing, R. R., Ryan, D. H., & Johnson, W. D. (2018). Implementing an Online Weight-Management Intervention to an Employee Population: Initial Experience with Real Appeal. In Obesity (Vol. 26, Issue 11, p. 1704). Wiley. https://doi.org/10.1002/oby.22309

Inoue, K., Athey, S., & Tsugawa, Y. (2023). Machine-learning-based high-benefit approach versus conventional high-risk approach in blood pressure management. In International Journal of Epidemiology (Vol. 52, Issue 4, p. 1243). Oxford University Press. https://doi.org/10.1093/ije/dyad037

Karasu, S. R. (2012). Of Mind and Matter: Psychological Dimensions in Obesity [Review of Of Mind and Matter: Psychological Dimensions in Obesity]. American Journal of Psychotherapy, 66(2), 111. American Psychiatric Association. https://doi.org/10.1176/appi.psychotherapy.2012.66.2.111

Kementrian Kesehatan RI, "Laporan Riskesdas 2018 Nasional," 2018.

Kessler, H. S., Sisson, S. B., & Short, K. R. (2012). The Potential for High-Intensity Interval Training to Reduce Cardiometabolic Disease Risk. In Sports Medicine (Vol. 42, Issue 6, p. 489). Springer Science+Business Media. https://doi.org/10.2165/11630910-000000000-00000

Kozakowski, J., Gietka-Czernel, M., Leszczyńska, D., & Majos, A. (2017). Obesity in menopause – our negligence or an unfortunate inevitability? In Menopausal Review (Vol. 2, p. 61). Termedia Publishing House. https://doi.org/10.5114/pm.2017.68594

Lartey, S. T., Si, L., Otáhal, P., Graaff, B. de, Boateng, G. O., Biritwum, R., Minicuci, N., Kowal, P., Magnussen, C. G., & Palmer, A. (2020). Annual transition probabilities of overweight and obesity in older adults: Evidence from World Health Organization Study on global AGEing and adult health. In Social Science & Medicine (Vol. 247, p. 112821). Elsevier BV. https://doi.org/10.1016/j.socscimed.2020.112821

Lin, F., Wei, D.-M., Lin, S.-T., Maddison, R., Mhurchú, C. N., Jiang, Y., Gao, Y., & Wang, H. (2017). Systematic review and meta-analysis of school-based obesity interventions in mainland China [Review of Systematic review and meta-analysis of school-based obesity interventions in mainland China]. PLoS ONE, 12(9). Public Library of Science. https://doi.org/10.1371/journal.pone.0184704

Luisi, M., Biffi, B., Gheri, C. F., Sarli, E., Rafanelli, E., Graziano, E., Vidali, S., Fattirolli, F., Gensini, G. F., & Macchi, C. (2015). Efficacy of a nutritional education program to improve diet in patients attending a cardiac rehabilitation program: outcomes of a one-year follow-up. In Internal and Emergency Medicine (Vol. 10, Issue 6, p. 671). Springer Science+Business Media. https://doi.org/10.1007/s11739-015-1211-y

Mackey, R. H., McTigue, K. M., & Kuller, L. H. (2012). The Obesity Epidemic and Women's Health. In Elsevier eBooks (p. 855). Elsevier BV. https://doi.org/10.1016/b978-0-12-384978-6.00056-x

Marsden, A., Hann, M., Barron, E., Ross, J., Valabhji, J., Murray, E., & Cotterill, S. (2023). Comparison of weight change between face-to-face and digital delivery of the English National Health service diabetes prevention programme: An exploratory non-inferiority study with imputation of plausible weight outcomes. In Preventive Medicine Reports (Vol. 32, p. 102161). Elsevier BV. https://doi.org/10.1016/j.pmedr.2023.102161

Obert, J., Pearlman, M., Obert, L., & Chapin, S. (2017). Popular Weight Loss Strategies: a Review of Four Weight Loss Techniques [Review of Popular Weight Loss Strategies: a Review of Four Weight Loss Techniques]. Current Gastroenterology Reports, 19(12). Springer Science+Business Media. https://doi.org/10.1007/s11894-017-0603-8

Overweight and obesity on the rise in all age and income groups. (2022). https://www.unicef.org/indonesia/press-releases/indonesia-overweight-and-obesity-rise-all-age-and-income-groups

Perrey, S. (2022). Training Monitoring in Sports: It Is Time to Embrace Cognitive Demand [Review of Training Monitoring in Sports: It Is Time to Embrace Cognitive Demand]. Sports, 10(4), 56. Multidisciplinary Digital Publishing Institute. https://doi.org/10.3390/sports10040056

Pucci, A., & Batterham, R. L. (2020). Endocrinology of the Gut and the Regulation of Body Weight and Metabolism. https://pubmed.ncbi.nlm.nih.gov/32352695/

Reinboth, M., Sundgot-Borgen, J., & Bratland-Sanda, S. (2022). Exercise Dependence and Body Image Concerns Amongst Group Fitness Instructors: A Self-Determination Theory Approach. In Frontiers in Psychology (Vol. 12). Frontiers Media. https://doi.org/10.3389/fpsyg.2021.816287

Rizky, E. (2020). Analisis Keterampilan Shooting Sepak Bola: Efek Power Dan Percaya Diri Atlet. *INSPIREE Indonesian Sport Innovation Review* (Vol. 1, Issue 1, p. 16). https://doi.org/10.53905/inspiree.v1i1.4

Senior, J. (2015). Culturally Tailored Nutrition Education Interventions: Why Focus on African American Women? In Journal of Nutritional Health & Food Engineering (Vol. 2, Issue 2). MedCrave Group. https://doi.org/10.15406/jnhfe.2015.02.00048

Teede, H., Tay, C. T., Laven, J. J. E., Dokras, A., Moran, L., Piltonen, T., Costello, M., Boivin, J., Redman, L. M., Boyle, J., Norman, R. J., Mousa, A., & Joham, A. E. (2023). Recommendations From the 2023 International Evidence-based Guideline for the Assessment and Management of Polycystic Ovary Syndrome. In The Journal of Clinical Endocrinology & Metabolism (Vol. 108, Issue 10, p. 2447). Oxford University Press. https://doi.org/10.1210/clinem/dgad463

Thamrin, S. A., Arsyad, D. S., Kuswanto, H., Lawi, A., & Arundhana, A. I. (2022). Obesity Risk-Factor Variation Based on Island Clusters: A Secondary Analysis of Indonesian Basic Health Research 2018. In Nutrients (Vol. 14, Issue 5, p. 971). Multidisciplinary Digital Publishing Institute. https://doi.org/10.3390/nu14050971

Tsang, T. W., Kohn, M., Chow, C. M., & Singh, M. A. F. (2010). Kung Fu Training Improves Physical Fitness Measures in Overweight/Obese Adolescents: The "Martial Fitness" Study. In Journal of Obesity (Vol. 2010, p. 1). Hindawi Publishing

Corporation. https://doi.org/10.1155/2010/672751

Tsang, T. W., Kohn, M., Chow, C. M., & Singh, M. F. (2013). Self-Perception and Attitude Toward Physical Activity in Overweight/Obese Adolescents: The "Martial Fitness" Study. In Research in Sports Medicine (Vol. 21, Issue 1, p. 37). Taylor & Francis. https://doi.org/10.1080/15438627.2012.738444

Vasconcelos, B. B., Protzen, G. V., Galliano, L. M., Kirk, C., & Vecchio, F. B. D. (2020). Effects of High-Intensity Interval Training in Combat Sports: A Systematic Review with Meta-Analysis. In The Journal of Strength and Conditioning Research (Vol. 34, Issue 3, p. 888). Lippincott Williams & Wilkins. https://doi.org/10.1519/jsc.0000000000003255

Westcott, W. L. (2016). STRENGTH TRAINING FOR THOSE WHO NEED IT MOST. In ACSM's Health & Fitness Journal (Vol. 20, Issue 5, p. 23). Lippincott Williams & Wilkins. https://doi.org/10.1249/fit.0000000000000237

Author information

Information about the authors/Author Biographies:

Author Information	
Surya Adi Saputra (Author 1) Corresponding Authors	https://orcid.org/0000-0002-2400-4861 Faculty of Sports Science at Universitas Negeri Malang, Indonesia. **Address:** St. Cakrawala No.5, Malang City, East Java, 65145, Indonesia. **Disciplines:** Physical Education **Skills And Expertise:** Physical Education Authors' Contribution: abcde Contact e-Mail: surya.adi.fik@um.ac.id
Septiani Dewi Hamni Author 2)	https://orcid.org/0009-0008-4006-171X Faculty of Sports Science at Universitas Negeri Malang, Indonesia. **Address:** St. Cakrawala No.5, Malang City, East Java, 65145, Indonesia. **Disciplines:** Sport Education **Skills And Expertise:** Sport Combat and Education Authors' Contribution: abcd Contact e-Mail: septiani.dewi.2203436@students.um.ac.id
Exie Shirley (Author 3)	https://orcid.org/0009-0009-9580-0839 Exercise science, University of Salzburg, Austria. **Address:** Kapitelgasse 4/6, 5020 Salzburg, Austria **Disciplines:** Sport Nutrition and Health **Skills And Expertise:** Sport Nutrition **Authors' Contribution**: abcd Contact e-Mail: exiesyko@outlook.com
Helen Knowles (Author 4)	https://orcid.org/0009-0003-6958-581X OSU-OKC Fire Academy, Oklahoma State University, Unites States. **Address:** 1723 W Tyler Ave, Stillwater, OK 74075, Unites States. **Disciplines:** Sport Science **Skills And Expertise:** Sport Combat **Authors' Contribution**: acd Contact e-Mail: helenau5kn@outlook.com