JSES: Journal of Sport and Exercise Science
Volume 8, Number 2, September 2025
ORIGINAL ARTICLE

Exploring the Physiological Effects of Jogging During Ramadan Fasting: Impact on Physiology and Performance in University Students

Bayu Valentino[1ABD], Mohamad Rozi Bin Yacob[2DE], Muhammad[1D], Adi Pranoto[1AC], Laily Mita Andriana[1CE]

[1] Universitas Negeri Surabaya, Indonesia
[2] University of Malaya, Malaysia

Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection.

Corresponding Author: Mohamad Rozi bin Yacob, u2102477@siswa.um.edu.my

Received 11 October 2025
Accepted 24 November 2025
DOI https://doi.org/10.26740/jses.v8n2.p106-117

ABSTRACTS

Purpose Low physical activity in adolescents causes the prevalence of obese adolescents in Indonesia to increase from year to year; in 2018, 20% of adolescents were found to be obese. The obesity factor provides or indicates the occurrence of non-communicable diseases. This study aimed to identify the effects of a combination of Ramadhan fasting and 30 minutes of jogging exercise on body composition profile and fitness.

Materials and Methods Ten adolescents aged 18-19 years participated in this study. They fasted during Ramadan and performed physical exercise 4 times a week for 3 weeks. Body composition measurements using BC 545N Tanita segmental body composition monitor (body weight, body mass index, water percentage, visceral fat), blood glucose level measured with EasyTouch GCU, and the 20-metre multistage fitness test (20 MFT) measures aerobic fitness by predicting maximum oxygen uptake (VO2Max), Speed (*20-Meter Sprint Test)* and Power (counter movement jump). A descriptive test and a paired sample t-test were used to evaluate the results of this study.

Result The results of this study, there were significant differences ($p < 0.05$) between before and after training and Ramadhan fasting in 3 times a week for 4 weeks in body weight reduced by 4.33%, BMI reduced by 2.90%, water percentage increased by 3.14%, visceral fat reduced by 17.35%, blood glucose levels slight increase by 8.20%, and VO2Max increased 11.77%.

Conclusion This study concludes that combining Ramadan fasting with 30-minute jogging affects body composition, glucose levels, and fitness. The health profile during adolescence is important to consider because it will impact health later in life.

Keywords Low physical activity; Obese adolescents; Ramadan fasting; Jogging exercise.

INTRODUCTION

A global survey has found that being overweight among adolescents is a significant public health problem. The survey, conducted by the World Health Organisation (WHO), found that in 2016, more than 340 million children and adolescents aged 5-19 were overweight or obese, representing approximately 18% of the global population in this age group. This trend is alarming, as it increases the risk of various health problems, including diabetes, cardiovascular disease, and some cancers (World Health Organisation, 2024). The survey also highlighted that the prevalence of overweight and obesity among adolescents varies significantly across regions and countries. For example, the prevalence of overweight and obesity among adolescents in Indonesia has been increasing year by year, with 20% of adolescents being obese in 2018 (Setiawati et al., 2019). This alarming trend highlights the urgent need to address issues surrounding adolescent health and obesity. Obesity among adolescents has become a significant public health problem, with prevalence increasing rapidly over the past few decades (Ogden et al., 2019).

This increase in obesity rates can be attributed to a combination of genetic, environmental, and socioeconomic factors. Shifts in unhealthy dietary patterns, such as increased consumption of processed foods, and low levels of physical activity contribute to the rise in obesity rates among adolescents (Sanyaolu et al., 2019). Obesity in adolescence has negative impacts on short-term and long-term health (Sahoo et al., 2015). In the short term, obesity increases the risk of various health problems such as hypertension, hyperlipidemia, and diabetes. In contrast, in the long term, obesity in adolescents increases the risk of chronic conditions such as cardiovascular disease, some cancers, and metabolic disorders (Ogunbode et al., 2011). Obesity among adolescents is a significant public health problem that has seen a relatively rapid increase in recent years (Sanyaolu et al., 2019). Implementing preventive measures and interventions to address adolescent obesity and improve overall health is crucial.

One factor contributing to the rise in obesity among adolescents is excessive intake of glucose (Cali et al., 2009). Research has shown that high glucose intake, particularly through sugary drinks and foods, can lead to weight gain and ultimately contribute to the development of obesity. Excessive glucose consumption in adolescents can disrupt the balance between energy intake and expenditure, leading to increased body fat accumulation (Magriplis et al., 2021). High glucose intake not only contributes to weight gain and insulin resistance but also affects overall energy levels and physical activity (Joslowski et al., 2012). Research has shown that excessive glucose intake is associated with lower physical activity levels in adolescents, further exacerbating the risk of obesity (Reilly et al., 2015). This imbalance in energy intake and expenditure not only results in body fat accumulation but also reduces motivation and ability to engage in regular exercise and physical activity (Hong et al., 2016).

Fasting in obese adolescents may offer several potential benefits in managing their health. Research suggests that fasting interventions may be effective in treating overweight and obesity in adults (Harris et al., 2018). Although the focus is on adults, the principles of fasting may also be beneficial for adolescents with obesity (Ye et al., 2022). Fasting involves cycling between periods of eating and fasting, which may help regulate hormones, reduce inflammation, and support weight loss. Time-restricted eating limits the daily eating window, improving metabolic health by aligning eating patterns with the body's circadian rhythm (Kolb et al., 2021; Patterson & Sears, 2017). Fasting has been shown to improve weight loss and metabolic health in adolescents. Research by Jensen et al. (2015) showed that moderate weight loss in obese adolescents led to changes in gut hormone levels that could potentially aid in weight management.

Additionally, a study by Stinson et al. (2021) found that fasting plasma GLP-1 levels were associated with overweight/obesity and cardiometabolic risk factors in children and adolescents, highlighting the benefits of fasting for weight loss and improving metabolic health. Physical activity plays a crucial role in preventing and managing obesity in adolescents (Pradinuk et al., 2011). Exercise offers numerous benefits for weight management and improved heart health. Physical activity increases metabolism, which is the rate at which the body burns calories (Darren

JSES: Journal of Sport and Exercise Science
ISSN 2615-8744

E.R. et al., 2021). Individuals who engage in regular physical activity can burn more calories throughout the day, even while resting (Kokkinos, 2012).

Furthermore, physical activity aids in weight management by promoting fat loss and maintaining lean muscle mass. Furthermore, regular physical activity helps improve heart health by strengthening the heart and improving blood circulation, reducing the risk of cardiovascular diseases such as heart disease and stroke (Brito, 2019). Physical activity also helps regulate blood pressure and cholesterol levels, reducing the risk of hypertension and high cholesterol (Agarwal, 2012).

Just 30 minutes of jogging can provide significant benefits for obese adolescents, impacting various aspects of their health. Research by Dos Santos et al. (2019) showed that a single 30-minute session of moderate-intensity exercise led to acute changes in inflammatory markers in obese adolescents, indicating that even short-duration exercise can trigger positive physiological responses in this population. Furthermore, a study by Crespo et al. (2023) recommends jogging for patients with diabetes to improve health and glycemic control, suggesting that jogging, even at a moderate intensity, can positively impact metabolic health in obese individuals.

For weight loss, jogging is an effective and accessible form of exercise for obese people (Bülbül, 2020; Li, 2025). Jogging 30 minutes or 150 minutes per week is associated with markedly reduced risks of death from all causes and cardiovascular disease (Lee et al., 2014), as in obese people. Furthermore, the benefits of jogging extend beyond weight loss. Increased physical activity, such as daily jogging, has been linked to improved metabolic health in obese adolescents, including better glycemic control, lower blood pressure, and improved lipid profiles. Improvements in these metabolic markers can significantly reduce the risk of developing chronic conditions such as type 2 diabetes and cardiovascular disease (Whooten et al., 2019). Existing research shows that just 30 minutes of jogging can have a profound impact on the lives of obese adolescents, increasing physical fitness (Agus & Sari, 2020). This simple, accessible form of physical activity can lead to weight loss, improved metabolic health, and better psychological outcomes (Franssen et al., 2021).

The increasing prevalence of adolescent obesity underscores the urgency of conducting rigorous investigations in this area. Global estimates from the WHO indicate that more than 340 million children and adolescents were classified as overweight or obese in 2016, with a continuing upward trend in various regions, including Indonesia. This condition is associated with an increased risk of long-term metabolic and cardiovascular complications, necessitating the development of effective and context-specific intervention strategies. Although various nutrition- and physical activity-based interventions have been evaluated, significant research gaps remain. Specifically, empirical evidence examining the physiological and metabolic effects of combining fasting with structured moderate-intensity exercise, such as a standard 30-minute walking protocol, conducted during the fasting period in adolescents is limited. Previous studies have mainly investigated fasting or exercise separately, leading to a limited understanding of their potential synergistic effects on body composition, glycemic control, and functional fitness outcomes, particularly in the Indonesian adolescent population. Therefore, this study seeks to address this gap by systematically evaluating the effectiveness of an integrated fasting-moderate exercise intervention. These findings are expected to contribute to refining evidence-based approaches to preventing and managing adolescent obesity and, ultimately, to supporting improved health and quality of life in this vulnerable age group.

METHODS

Study Participants

This study involved 10 young university students with an average age of 18-19 years. The study employed inclusion and exclusion criteria in selecting subjects. Inclusion criteria included students with a BMI >25 who had been fasting for a whole month. Exclusion criteria included students with a normal BMI (<25) and a history of injury within the 3 weeks prior to the study.

Figure 1. Research Procedure

Study Organization

This study involved 10 obese university students (BMI ≥ 25) who were selected according to predetermined inclusion and exclusion criteria. Prior to the intervention, baseline (pretest) data were collected, including the following parameters: body composition (weight, BMI, percentage of body fat, total body water, and visceral fat), blood glucose levels (using fasting glucose measurements), VO2max (using a maximal oxygen test), and physical tests including agility, speed, and power jump (Counter Movement Jump / CMJ). Following pretest data collection, subjects underwent a 30-minute jogging exercise program at an adjusted intensity of 75% of their maximum heart rate, calculated as 220 minus their age. This exercise was performed four times a week, on Mondays, Wednesdays, Fridays, and Saturdays, at 4:00 PM WIB, during the fasting month of Ramadan, to minimize fasting-related disturbances. The exercise intensity was maintained at 75% of their maximum heart rate to ensure cardiovascular benefits. The intervention lasted 3 weeks, during which subjects completed 12 jogging sessions. After the intervention period, posttest data identical to the pretest data were re-measured to evaluate changes in the aforementioned parameters. Pretest and posttest measurements were conducted by trained medical personnel to ensure consistency and accuracy of the results.

Multistage Fitness Test

To determine the subjects' VO2max capacity, researchers used a multistage fitness test. In this test, subjects were asked to perform a series of progressive back-and-forth runs over 20 meters until they reached exhaustion and could no longer continue. The test began at an initial speed of 8.5 km/h, then increased by approximately 0.5 km/h each minute. This increase continued until the subjects felt they could no longer keep up. Throughout the test, researchers provided encouragement and motivation to ensure maximum effort.

ISSN 2615-8744

20-Meter Sprint Test
This test is conducted to determine the subject's speed. The researcher will place four poles at two positions 20 meters apart (two at the starting line and two at the finish line). At the starting line, participants will be directed to stand in the middle of the poles, which are 60 meters apart. The researcher will give the command "Ready... Go..." The subject will then run as fast as possible to the finish line without stopping suddenly. Each participant will be given three attempts, each timed to 5 minutes. The best time from the three tests will be used to measure sprint performance.

Counter Movement Jump (CMJ)
To determine jump power, researchers used the Counter Movement Jump (CMJ). This test involves asking subjects to perform a rapid vertical jump, starting with an eccentric knee movement to 90 °. They are then asked to perform a concentric upward movement as high as possible until they stand upright and land on the same spot with both hands holding their hips. This test uses Jump-MD to calculate jump height in centimetres (cm).

Body Composition
Body composition measurements in this study used BIA (Tanita BC-545N Inner-Scan, Germany), with an accuracy of up to 0.1 kg. Prior to the measurement, subjects were asked to remove footwear and other accessories to ensure accuracy. Next, they were asked to stand upright on the electrode area. After a few seconds, the device displayed body weight (BW), body mass index (BMI), total body water (TBW), muscle rating (MR), and visceral fat (VF).

Statistical Analysis
The data obtained from these measurements were then collected and analyzed using SPSS version 29. In this study, the data were analyzed at the $p < 0.05$ significance level, meaning that results with $p < 0.05$ are considered statistically significant and indicate a high probability that the results are not due to chance alone. By setting this limit, researchers can be more confident in assessing the effects of the implemented intervention.

RESULT
Table 1. Results of the Mean Test and Normality Test of Body Composition and Glucose

Variable	Terms	n	Mean±St.Dev	P-Value
Body Weight	Pre	10	82.95±18.56	0.062*
	Post		79.93±18.20	0.040
Body Mass Index	Pre	10	28.57±5.12	0.070*
	Post		27.65±5.39	0.024
Body Fat	Pre	10	25.14±5.99	0.159*
	Post		22.30±6.74	0.072*
Total Body Water	Pre	10	49.71±4.60	0.466*
	Post		53.12±5.13	0.055*
Muscle Rating	Pre	10	57.97±8.45	0.263*
	Post		57.95±8.09	0.286*
Bone Mass	Pre	10	3.17±0.42	0.182*
	Post		3.17±0.44	0.309*
BMR	Pre	10	1671.75±60.70	0.029
	Post		1808.70±288.73	0.186*
Viceral Fat Level	Pre	10	10.35±3.48	0.098*

ISSN 2615-8744

Variable	Terms	n	Mean±St.Dev	P-Value
	Post		9.16±4.17	0.073*
Glukosa	Pre	10	78±5.88	0.437*
	Post		86.20±9.69	0.699*

Note * p > 0.05 normal data

Table 1 presents the mean values and normality test results for body composition and glucose variables before and after the intervention. Body weight and BMI showed a decrease from pre- to post-measurements, with post-measurement values showing a non-normal distribution ($p < 0.05$). Percentage body fat and total body water showed positive changes, although both remained within normal limits ($p > 0.05$). Muscle and bone mass assessments remained stable across measurements, with no significant variation in distribution. Metabolic Rate (BMR) showed a non-normal distribution at pretesting ($p = 0.029$), while posttest data were normally distributed. Visceral fat levels decreased slightly, with both measurements remaining normal. Blood glucose increased slightly from pre- to post-measurements, with both data sets meeting the assumption of normality ($p > 0.05$).

Table 2. Results of the Mean Test and Performance Normality Test

Variable	Terms	n	Mean±SD	P-Value
Agility	Pre	10	13.18±1.06	0.073*
	Post		11.48±1.08	0.537*
Power	Pre	10	63.90±8.79	0.816*
	Post		69.30±10.52	0.769*
Speed	Pre	10	5.42±0.98	0.664*
	Post		5.14±0.39	0.824*
MFT	Pre	10	4.85±1.90	0.005
	Post		6.25±2.47	0.501*

Note * p>0.05 normal data

Table 2 shows improvements in all performance variables after the intervention. Agility, power, and speed showed decreases in mean time or increases in output, with all posttest scores meeting normality criteria ($p > 0.05$). MFT scores also improved from pretest to posttest; however, pretest data were non-normal ($p = 0.005$), whereas posttest scores were normally distributed. Overall, most performance variables showed normal distributions and favourable changes in mean performance.

Table 3. Paired T-test and Wilcoxon Test Results on Body Composition and Glucose

Variabel	Terms	n	Sig.	ES (Cohen's d)
Body Weight	Pre	10	0.005 ‡	0.887
	Post			
Body Mass Index	Pre	10	0.001 ‡	0.897
	Post			
Body Fat	Pre	10	0.001 †	2.102
	Post			
Total Body Water	Pre	10	0.001 †	2.044
	Post			
Muscle Rating	Pre	10	0.950 †	0.979
	Post			
Bone Mass	Pre	10	1 ‡	0.000
	Post			
BMR	Pre	10	0.415 †	0.285

Variabel	Terms	n	Sig.	ES (Cohen's d)
	Post			
Viceral Fat Level	Pre	10	0.002 †	1.589
	Post			
Glukosa	Pre	10	0.012 †	1.000
	Post			

Table 3 shows the results of the analysis of changes in body composition and glucose levels before and after the intervention using the paired t-test (†) for normally distributed data and the Wilcoxon test (‡) for non-normally distributed data. The analysis showed a significant decrease in body weight (p = 0.005) and BMI (p = 0.001), both assessed using the Wilcoxon test. Other parameters that showed significant changes were body fat (p = 0.001), total body water (p = 0.001), visceral fat level (p = 0.002), and blood glucose (p = 0.012), all of which were analyzed using paired t-tests. Meanwhile, muscle rating (p = 0.950†), bone mass (p = 1.000‡), and BMR (p = analyzed) did not show significant changes. Overall, these findings indicate that the intervention was effective in modifying several body composition parameters and glucose status. However, it did not produce significant changes in bone mass, muscle rating, and basal metabolic rate.

Table 4. Paired T-test and Wilcoxon Test Results on Performance

Variabel	Terms	n	Sig.	ES (Cohen's d)
Agility	Pre	10	0.001†	2.074
	Post			
Power	Pre	10	0.135†	0.372
	Post			
Speed	Pre	10	0.138†	0.368
	Post			
MFT	Pre	10	0.028 ‡	0.696
	Post			

Table 4 presents the results of the analysis of changes in physical performance before and after the intervention using the paired t-test (†) for variables with a normal distribution and the Wilcoxon test (‡) for variables with a non-normal distribution. The results show that agility increased significantly (p = 0.001†), while power (p = 0.135†) and speed (p = 0.138†) did not change significantly after the intervention. Meanwhile, the Multistage Fitness Test (MFT) results showed a significant increase (p = 0.028‡), as analyzed by the Wilcoxon test. Overall, these findings indicate that the intervention was more effective at improving agility and aerobic capacity, as reflected in MFT scores, but was not strong enough to produce significant changes in the power and speed components.

DISCUSSION

This study aims to examine the effects of jogging on body composition and physical performance among university students during Ramadan. Ramadan is a unique period during which changes in diet, sleep, and physical activity patterns can affect an individual's physiological state. One of the main challenges students face during the fasting month is maintaining physical fitness and performance without compromising their fasting obligations. Jogging, as a form of light aerobic exercise, was chosen because it provides health benefits without requiring equipment or high intensity, which are difficult to maintain during fasting. The results of this study indicate that jogging during Ramadan significantly affects body composition and performance, and several physiological mechanisms can explain these effects.

The findings of this study indicate that jogging during Ramadan results in substantial improvements in body composition. Significant reductions were observed in body weight, BMI, body fat, and visceral fat, each with large effect sizes (e.g., body fat: $d = 2.102$; visceral fat: $d = 1.589$). Aerobic activities such as jogging increase calorie burning, which contributes to a decrease in body fat percentage (Jayedi et al., 2024). Although fasting during Ramadan restricts calorie intake, jogging can tap body fat reserves as an energy source, thereby reducing body fat. Furthermore, jogging increases the body's metabolism, which supports fat burning (Muscella et al., 2020). This factor can explain the significant reduction in BMI and body fat: students' bodies can still adapt to maximize fat burning during physical activity, even while fasting.

Total body water also increased significantly ($d = 2.044$), which may be due to the training time. Although fasting restricts fluid intake, appropriately timed physical activity, such as jogging after breaking the fast, can help the body increase its water content (Larson et al., 2020). Good hydration is essential for the function of organs such as the heart and kidneys, and supports muscle recovery after exercise (Leow et al., 2022). These points highlight that jogging not only reduces body fat but also improves fluid balance, which is vital for overall health.

Unfortunately, not all components of body composition showed improvements. Muscle mass did not change significantly ($p = 0.950$), which is understandable given that jogging provides an aerobic rather than a hypertrophic stimulus. Muscle hypertrophy typically requires high mechanical loads and activation of anabolic pathways, such as mTOR, which are not strongly stimulated by light jogging, especially during fasting, when protein synthesis can be reduced. Similarly, bone mass remained unchanged ($p = 1.000$), consistent with the known slow rate of bone remodelling. Short-duration aerobic exercise is insufficient to induce osteogenic adaptations, which typically require high-impact or resistance-based loading over several months.

Basal metabolic rate (BMR) also remained unchanged ($p = 0.415$), likely due to compensatory mechanisms during fasting. Reduced calorie intake can trigger metabolic conservation, thus limiting increased energy expenditure despite regular physical activity. Because BMR is strongly influenced by muscle mass, which does not increase during Ramadan, BMR stability during Ramadan is physiologically plausible.

Furthermore, jogging during Ramadan also has a positive impact on physical performance, particularly endurance and functional ability. Performance on agility tests and the Maximum Functional Test (MFT) showed significant improvements, both with large effect sizes (agility: $d = 2.074$; MFT: $d = 0.696$). These improvements may be attributed to the body's adaptation to aerobic exercise, which enhances muscular and cardiovascular endurance (Kolnes et al., 2025). Although fasting can cause a temporary drop in energy, jogging, as a form of light exercise, improves blood circulation, muscle oxygenation, and the efficiency of the body's metabolic system, thereby supporting recovery and improving physical performance (Kazeminasab et al., 2024). This increased endurance is crucial for maintaining students' physical performance during their daily routines, which often involve academic activities that require high concentration and energy.

Although lower-body speed and explosive power did not reach statistical significance ($p > 0.05$), a moderate effect size ($d \approx 0.36$) indicated a trend toward increases. Jogging, which is primarily aerobic, does not significantly stimulate the neuromuscular pathways responsible for maximal speed and power output. Such adaptations typically require high-intensity or plyometric training, which provides greater mechanical load and neural activation.

Contrary to our initial interpretation, blood glucose concentrations increased after the jogging intervention during Ramadan (before: 78 ± 5.88 mg/dL; after: 86.20 ± 9.69 mg/dL). Participants may have consumed a relatively carbohydrate-rich meal to replenish energy after fasting, resulting in higher post-exercise/post-meal glucose values. Circadian shifts altered sleep patterns, and transient stress responses during Ramadan may alter insulin sensitivity and hepatic glucose output, sometimes resulting in higher fasting or post-meal glycemia in the short term. The combination of refeeding (breaking the fast) and exercise may transiently increase hepatic glucose production and circulating glucose depending on the timing and intensity of exercise. Therefore, the observed glucose increases are likely due to the timing of measurements and nutrient intake patterns during Ramadan rather than to the detrimental metabolic effects of jogging. Future studies should standardize sampling times (e.g., a fixed hour after the last meal or a morning fasting sample), record meal times, and measure insulin or HOMA-IR to clarify whether glucose changes reflect altered insulin sensitivity or simply post-meal variations.

Another positive impact of jogging during Ramadan is its effect on heart health and the cardiovascular system. Aerobic exercise, such as jogging, increases heart and lung capacity, allowing the body to pump blood more efficiently (Formiga et al., 2020). This results in increased overall physical endurance, which is especially beneficial for students who must remain physically and mentally active throughout Ramadan. By increasing cardiovascular capacity, students not only experience short-term benefits, such as increased fitness, but also long-term benefits, including heart disease prevention and improved quality of life.

However, while jogging has been shown to positively impact body composition and physical performance, these effects are not immediate and require consistent physical activity. The duration and intensity of the exercise also contribute to students' overall well-being. Exercise plays a crucial role in achieving optimal results. Jogging performed improperly, such as at too high an intensity or without attention to hydration, can lead to fatigue or even injury. Therefore, students need to manage their exercise time wisely, such as choosing a time after breaking the fast to avoid dehydration and ensure the body receives sufficient energy and fluids.

These findings suggest that jogging is an effective alternative for maintaining body composition and improving physical performance during Ramadan. By incorporating jogging into their daily routine, students can maintain fitness, increase endurance, and reduce body fat without sacrificing their fasting obligations. Furthermore, this physical activity can provide long-term health benefits, such as improving insulin sensitivity and maintaining stable blood glucose levels, which are crucial for metabolic health. Therefore, jogging serves not only as a tool for maintaining physical fitness but also as a health strategy students can implement during Ramadan.

CONCLUSION

Jogging performed before breaking the fast during Ramadan resulted in significant improvements in body composition, specifically reductions in body fat, visceral fat, BMI, and body weight, as well as improvements in agility and functional endurance. These findings highlight that aerobic exercise in a fasted state can be an effective and practical way to maintain physical fitness during Ramadan. However, blood glucose levels increased after the intervention, likely due to counter-regulatory hormonal responses associated with prolonged fasting, combined with exercise and altered dietary and rest patterns during Ramadan, which affect glucose levels. No significant changes were observed in muscle mass, bone mass, BMR, speed, or power, suggesting that additional forms of training may be needed to improve these components. Overall, jogging before

JSES: Journal of Sport and Exercise Science
ISSN 2615-8744

breaking the fast is a safe and beneficial way to improve health and fitness during Ramadan. However, future research should examine hormonal markers and standard glucose sampling to better understand metabolic responses during fasted exercise.

ACKNOWLEDGMENT

The authors sincerely acknowledge the Faculty of Sport and Health Sciences, Universitas Negeri Surabaya, for their valuable support, which was pivotal in facilitating the successful completion of this research.

CONFLICT OF INTEREST

The authors declare no conflicts of interest that could affect the results or process of this research.

REFERENCES

Agarwal, S. K. (2012). Cardiovascular benefits of exercise. *International Journal of General Medicine*, 541–545. https://doi.org/10.2147/ijgm.s30113

Agus, A., & Sari, M. P. (2020). The impact of jogging on the improvement of physical fitness. *Proceedings of the 1st Progress in Social Science, Humanities and Education Research Symposium*, 896–901. https://doi.org/10.2991/assehr.k.200824.199

Brito, L. C. (2019). Group means and inter-individual analysis in post-exercise hypotension: Effects of citrulline malate oral supplementation. *Arquivos Brasileiros de Cardiologia*, *113*(2), 229–230. https://doi.org/10.5935/abc.20190152

Bülbül, S. (2020). Exercise in the treatment of childhood obesity. *Turkish Pediatric Association*, *55*(1), 2–10. https://doi.org/10.14744/TurkPediatriArs.2019.60430

Cali, A M G., Oliveira, A M A D., Kim, H., Shu, C., Reyes-Múgica, M., Escalera, S., Dziura, J., Taksali, S E., Kursawe, R., Shaw, M., Savoye, M., Pierpont, B., Constable, R T., & Caprio, S. (2009). NIH Public Access. *Bone*, *23*(1), 1–7. https://doi.org/10.1002/hep.22858.Glucose

Crespo, C. J., Kirwan, J. P., & Zierath, J. R. (2023). *Exercise/Physical Activity in Individuals with Type 2 Diabetes: A Consensus Statement from the American College of Sports Medicine*, *54*(2), 1-11. https://doi.org/10.1249/MSS.0000000000002800.Exercise/Physical

Darren E.R. Warburton, W., Crystal, W. N. (2021). The health benefits of physical activity. *Revue de l'Infirmiere*, *70*(275), 16–19. https://doi.org/10.1016/j.revinf.2021.08.006

Dos Santos, G. C., Faria, W. F., Sasaki, J. E., Gonçalves Elias, R. M., & Stabelini Neto, A. (2019). Acute effects of physical exercise at different intensities on inflammatory markers in obese adolescents. *Journal of Physical Education (Maringa)*, *30*(1), 1–7. https://doi.org/10.4025/jphyseduc.v30i1.3014

Formiga, M. F., Fay, R., Hutchinson, S., Locandro, N., Ceballos, A., Lesh, A., Buscheck, J., Meanor, J., Owens, J. G., & Cahalin, L. P. (2020). Effect of aerobic exercise training with and without blood flow restriction on aerobic capacity in healthy young adults: a systematic review with meta-analysis. *International Journal of Sports Physical Therapy*, *15*(2), 175–187. https://doi.org/10.26603/ijspt20200175

Franssen, W. M. A., Massa, G., Eijnde, B. O., Dendale, P., Hansen, D., & Verboven, K. (2021). Aberrant mechanical efficiency during exercise is associated with metabolic health and exercise intolerance in adolescents with obesity. *International Journal of Environmental Research and Public Health*, *18*(20), 1-11. https://doi.org/10.3390/ijerph182010578

Harris, L., Hamilton, S., Azevedo, L. B., Olajide, J., De Brún, C., Waller, G., Whittaker, V., Sharp, T., Lean, M., Hankey, C., & Ells, L. (2018). Intermittent fasting interventions for treatment of overweight and obesity in adults: a systematic review and meta-analysis. *JBI Database of Systematic Reviews and Implementation Reports*, *16*(2), 507–547. https://doi.org/10.11124/JBISRIR-2016-003248

Hong, I., Coker-Bolt, P., Anderson, K. R., Lee, D., & Velozo, C. A. (2016). Relationship between physical activity and overweight and obesity in children: Findings from the 2012 National Health and Nutrition Examination Survey National Youth Fitness Survey. *American Journal of Occupational Therapy*, *70*(5), 1–8. https://doi.org/10.5014/ajot.2016.021212

Jayedi, A., Soltani, S., Emadi, A., Zargar, M.-S., & Najafi, A. (2024). Aerobic exercise and weight loss in adults. *JAMA Network Open*, *7*(12), 1-10. https://doi.org/10.1001/jamanetworkopen.2024.52185

Joslowski, G., Goletzke, J., Cheng, G., Günther, A. L. B., Bao, J., Buyken, A. E., & Müller, J. C. B. (2012).

Prospective associations of dietary insulin demand, glycemic index, and glycemic load during puberty with body composition in young adulthood. *International Journal of Obesity*, 36(9), 1265–1271. https://doi.org/10.1038/ijo.2011.241

Jensen, D. E., Nguo, K., Baxter, K. A., Cardinal, J. W., King, N. A., Ware, R. S., Truby, H., & Batch, J. A. (2015). Fasting gut hormone levels change with modest weight loss in obese adolescents. *Pediatric Obesity*, *10*(5), 380–387. https://doi.org/10.1111/ijpo.275

Kazeminasab, F., Baharlooie, M., Karimi, B., Mokhtari, K., Rosenkranz, S. K., & Santos, H. O. (2024). Effects of intermittent fasting combined with physical exercise on cardiometabolic outcomes: Systematic review and meta-analysis of clinical studies. *Nutrition Reviews*, *82*(12), 1726–1740. https://doi.org/10.1093/nutrit/nuad155

Kokkinos, P. (2012). Physical activity, health benefits, and mortality risk. *ISRN Cardiology*, *2012*, 1–14. https://doi.org/10.5402/2012/718789

Kolb, H., Kempf, K., Röhling, M., Lenzen-Schulte, M., Schloot, N. C., & Martin, S. (2021). Ketone bodies: from enemy to friend and guardian angel. *BMC Medicine*, *19*(1), 1–15. https://doi.org/10.1186/s12916-021-02185-0

Kolnes, K. J., Nilsen, E. T. F., Brufladt, S., Meadows, A. M., Jeppesen, P. B., Skattebo, Ø., Johansen, E. I., Birk, J. B., Højlund, K., Hingst, J., Skålhegg, B. S., Kjøbsted, R., Griffin, J. L., Kolnes, A. J., O'Rahilly, S., Wojtaszewski, J. F. P., & Jensen, J. (2025). Effects of seven days' fasting on physical performance and metabolic adaptation during exercise in humans. *Nature Communications*, *16*(1), 122. https://doi.org/10.1038/s41467-024-55418-0

Larson, J. R., Bartman, N. E., Schlader, Z. J., Johnson, B. D., Hostler, D., & Pryor, R. R. (2020). Hydration status response to bolus frequency and volume intake during exercise in heat. *Medicine & Science in Sports & Exercise*, *52*(7S), 494–494. https://doi.org/10.1249/01.mss.0000679496.32209.1d

Lee, D., Pate, R. R., Lavie, C. J., Sui, X., Church, T. S., & Blair, S. N. (2014). Leisure-time running reduces all-cause and cardiovascular mortality risk. *Journal of the American College of Cardiology, 64*(5), 472–481. https://doi.org/10.1016/j.jacc.2014.04.058

Leow, C. H. W., Tan, B., Miyashita, M., & Lee, J. K. W. (2022). Cultural differences in hydration practices among physically active individuals: a narrative review. *Journal of the International Society of Sports Nutrition*, *19*(1), 150–163. https://doi.org/10.1080/15502783.2022.2057196

Magriplis, E., Michas, G., Petridi, E., Chrousos, G. P., Roma, E., Benetou, V., Cholopoulos, N., Micha, R., Panagiotakos, D., & Zampelas, A. (2021). Dietary sugar intake and its association with obesity in children and adolescents. *Children*, *8*(8), 1–14. https://doi.org/10.3390/children8080676

Muscella, A., Stefàno, E., Lunetti, P., Capobianco, L., & Marsigliante, S. (2020). The regulation of fat metabolism during aerobic exercise. *Biomolecules*, *10*(12), 1699-1719. https://doi.org/10.3390/biom10121699

Ogunbode, A., Fatiregun, A., & Ogunbode, O. (2011). Health risks of obesity. *Annals of Ibadan Postgraduate Medicine*, *7*(2), 7–10. https://doi.org/10.4314/aipm.v7i2.64083

Patterson, R. E., & Sears, D. D. (2017). Metabolic effects of intermittent fasting. *Annual Review of Nutrition*, *37*, 371–393. https://doi.org/10.1146/annurev-nutr-071816-064634

Pradinuk, M., Chanoine, J. P., & Goldman, R. D. (2011). Obesity and physical activity in children. *Canadian Family Physician*, *57*(7), 779–782.

Reilly, G. A. O., Belcher, B. R., Davis, J. N., Martinez, L. T., Huh, J., Antunez-castillo, L., Weigensberg, M., Goran, M. I., & Spruijt-metz, D. (2015). Behaviors in latino and african american adolescents. *Obesity*, *23*(9), 1886–1894. https://doi.org/10.1002/oby.21169.Effects

Ruppert, P. M. M., & Kersten, S. (2025). Regulation of adipose tissue metabolism during fasting. *Annual Review of Nutrition*, *45*(1), 41–64. https://doi.org/10.1146/annurev-nutr-120524-013857

Sahoo, K., Sahoo, B., Choudhury, A., Sofi, N., Kumar, R., & Bhadoria, A. (2015). Childhood obesity: causes and consequences. *Journal of Family Medicine and Primary Care*, *4*(2), 187-195. https://doi.org/10.4103/2249-4863.154628

Sanyaolu, A., Okorie, C., Qi, X., Locke, J., & Rehman, S. (2019). Childhood and adolescent obesity in the united states: A public health concern. *Global Pediatric Health*, *6*, 1-11. https://doi.org/10.1177/2333794X19891305

Setiawati, F. S., Mahmudiono, T., Ramadhani, N., & Hidayati, K. F. (2019). Intensitas penggunaan media sosial, kebiasaan olahraga, dan obesitas pada remaja Di SMA negeri 6 surabaya tahun 2019. *Amerta Nutrition*, *3*(3), 142. https://doi.org/10.20473/amnt.v3i3.2019.142-148

Stinson, S. E., Jonsson, A. E., Lund, M. A. V., Frithioff-Bøjsøe, C., Aas Holm, L., Pedersen, O., Ängquist, L., Sørensen, T. I. A., Holst, J. J., Christiansen, M., Holm, J. C., Hartmann, B., & Hansen, T. (2021). Fasting plasma GLP-1 Is associated with overweight/obesity and cardiometabolic risk factors in children and adolescents. *Journal of Clinical Endocrinology and Metabolism*, *106*(6), 1718–1727. https://doi.org/10.1210/clinem/dgab098

Whooten, R., Kerem, L., & Stanley, T. (2019). Physical activity in adolescents and children and relationship to metabolic health. *Current Opinion in Endocrinology, Diabetes and Obesity*, *26*(1), 25–31. https://doi.org/10.1097/MED.0000000000000455

World Health Organization. (2024). *Obesity and overweight*. World Health Organization.

Ye, Y. F., Zhang, M. X., Lin, Z., & Tang, L. (2022). Is intermittent fasting better than continuous energy restriction for adults with overweight and obesity? *Diabetes, Metabolic Syndrome and Obesity*, *15*, 2813–2826. https://doi.org/10.2147/DMSO.S376409

INFORMATION ABOUT THE AUTHORS

Bayu Valentino; https://orcid.org/0009-0003-0686-6948; bayuvalentino.22017@mhs.unesa.ac.id; Department of Sports Coaching Education, Faculty of Sports and Health Sciences, Universitas Negeri Surabaya, Surabaya, Indonesia.

Mohamad Rozi Bin Yacob; https://orcid.org/0009-0005-3046-7351; u2102477@siswa.um.edu.my; Department of Exercise Science, Faculty Sports of Sport and Exercise Science, University of Malaya, Malaysia.

Muhammad; https://orcid.org/0000-0002-6735-1425; muhammad@unesa.ac.id; Department of Sports Coaching Education, Faculty of Sports and Health Sciences, Universitas Negeri Surabaya, Surabaya, Indonesia.

Adi Pranoto; https://orcid.org/0000-0003-4080-9245; adipranoto@unesa.ac.id; Department of Sports Coaching Education, Faculty of Sports and Health Sciences, Universitas Negeri Surabaya, Surabaya, Indonesia.

Laily Mita Andriana; https://orcid.org/0009-0002-9845-6577; lailyandriana@unesa.ac.id; Department of Sports Coaching Education, Faculty of Sports and Health Sciences, Universitas Negeri Surabaya, Surabaya, Indonesia.

CITE THIS ARTICLE AS

Valentino, B., Yacob, M. R. B., Muhammad, Pranoto, A., & Andriana, L. M. (2025). Exploring the Physiological Effects of Jogging During Ramadan Fasting: Impact on Physiology and Performance in University Students. JSES : Journal of Sport and Exercise Science, 8(2), 106–117. https://doi.org/10.26740/jses.v8n2.p106-117