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Physical Therapy Media: Lemongrass and Salt Mixture for Pulse Restoration of Origin in Pencak Silat Athletes

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Abstract

Background: Post-exercise recovery is a crucial component of athletic training, particularly in combat sports such as pencak silat that impose high cardiovascular demands. Optimizing recovery strategies is essential to restore physiological homeostasis and support training continuity. Natural therapies based on locally available resources, including lemongrass and salt, offer promising alternatives.
Aims: This study aimed to examine the effect, difference, and efficiency of a physical therapy method using a mixture of lemongrass and salt on pulse restoration in pencak silat athletes.
Methods: A quantitative quasi-experimental design with a pretest–posttest control group approach was employed. Sixteen female pencak silat athletes aged 14–17 years were divided into a lemongrass and salt therapy group and an active rest control group. Pulse recovery was measured using a heart rate monitor following a bleep test protocol. Data analysis included descriptive statistics, normality and homogeneity tests, paired sample tests, and independent t-tests.
Result: The findings revealed a significant reduction in recovery pulse rate in the lemongrass and salt therapy group compared with the control group. Athletes receiving the intervention achieved faster pulse normalization, with recovery occurring approximately one minute earlier than in the active rest condition, and the between-group difference was statistically significant.
Conclusion: The study concludes that lemongrass and salt therapy is effective and more efficient than active rest in accelerating pulse recovery among pencak silat athletes. This natural intervention provides a practical and culturally relevant recovery strategy, supporting its integration into routine athletic training programs.

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INTRODUCTION

Pencak silat is an indigenous Indonesian culture that has four aspects, namely spiritual mental aspect, cultural art aspect, martial arts aspect, and sports aspect. These four aspects are in a complete unit (Kholis, 2016; Sutopo & Misno, 2021). Improving the achievement that has been targeted requires efforts to realize the plan by coaching athletes properly and correctly. The sports development system in Indonesia is a pyramid system, which includes 3 stages, namely, a) bulking, b) nurseries, c) improving achievement (Dwanita, 2020).

Sports achievement is the peak of athletes' performance achieved in a match or competition, after carrying out various training programs. Matches are held periodically and within a certain time to achieve the highest achievements. This is the culmination of all coaching processes, both through bulking and nurturing. Post-workout recovery is an important element of the training-adaptation cycle. The overall goal of recovery after exercise is to restore the homeostasis that occurs in the body's physiological system. After exercise, fluids and fuel lost or consumed during exercise should be

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replaced, regular body temperature and cardiovascular function should be restored, and damaged tissues should be repaired (Dwanita, 2020; Peake, 2019).

One of the recovery methods that is often used in pencak silat sports is active recovery. Effective recovery method to restore energy, pulse, and lactic acid levels after maximum exercise (Patah et al., 2021; Van Hooren & Peake, 2018). Recovery optimization is the process of maximizing opportunities when there is time to restore the body's condition to its original state of recovery. Adding aromatherapy at the time of recovery can help maximize the recovery period of the athlete (Kwon et al., 2020; Okada & Shimatani, 2024). One way to lower blood pressure is with warm water soaking therapy, soaking body parts in warm water can improve circulation, reduce edema, improve muscle relaxation. Soaking can also be accompanied by wrapping body parts in a bandage and moistening them with a warm solution (Albarrán-Planelles et al., 2014; Kim et al., 2020). Regeneration microcycles are one of the important elements in recovery.

Regeneration microcycles aim to eliminate fatigue and increase the athlete's preparation level, which ultimately improves performance. These microcycles are characterized by lower workout demands, which can be created by decreased exercise intensity or volume, or even a combination of both. Another approach to using this type of microcycle is to include activities that train psychological characteristics as targeted exercise but different from exercise activities in general(Mukhopadhyay, 2022). Regeneration microcycles pay attention to the athlete's pulse.

Pulse rate is a parameter used to measure a person's cardiovascular response to physical activity. When a person exercises, the pulse rate generally increases to meet the higher oxygen needs of the muscles. Factors such as hydration can also affect the pulse. Mineral water, which contains electrolytes, has a significant role in maintaining the body's hydration balance during and after physical activity (Judge et al., 2021). Pulse rate is generally also influenced by compounds such as those contained in brine, lemongrass, and others.

Salt (NaCl) is an ionic compound consisting of positive sodium (Na^+) ions and negative chloride ions (Cl^-) which function important in maintaining the balance of electrolytes and body fluids. In the world of sports therapy, the use of salt water to soak the feet has been proven to increase muscle relaxation, speed up blood circulation, and help detoxify the body through the skin (Darmawati et al., 2024). Lemongrass is an herbal plant that contains a lot of active compounds such as citral, limonene, eugenol, as well as vitamins and minerals such as vitamin A, vitamin C, potassium, and magnesium. Citral compounds function as anti-inflammatory, antiseptic, and muscle relaxants, making them ideal for use in athlete recovery therapy (Mukarram et al., 2022).

A preliminary study conducted by the author found that there is no research related to two natural ingredients (salt water and lemongrass) for the therapeutic medium of pulse recovery after intensive exercise. This research presents a novelty in the field of sports therapy by combining two natural ingredients, namely lemongrass (cymbopogon citratus) and salt water (NaCl), as a therapeutic medium for pulse recovery after intensive training in pencak silat athletes. In contrast to conventional recovery methods such as passive rest, or the use of single aromatherapy, this study offers a natural, accessible, and low-risk herbal-mineral combination approach as an alternative to physiological recovery.

Considering the limited scientific studies in the last 5 years as well as the facts in the field (based on the results of preliminary studies) that examine the specific effects of the combination of lemongrass and salt on the recovery pulse of pencak silatathletes, this research is feasible and important to be carried out as part of the innovation in the development of recovery methods based on natural ingredients. The purpose of this study is to determine the effect, difference, and efficiency of original recovery by calculating the original recovered pulse using the Physical Therapy Method of a mixture of salt and lemongrass in pencak silat athletes.

METHOD

Participants

The population in this study is all Pencak Silat athletes Tri Tunggal Jati Kebumen which totals 100 respondents. The sampling technique in this study uses the purposive sampling technique (Fraenkel et al., 2019), With inclusion criteria including athletes with active training for at least 4 months, ages 14-17 years, female gender, physically healthy and not allergic to lemongrass and salt.

Meanwhile, the exclusion criteria in this study include have a history of hypertension, skin disease, or cardiovascular disease.

Based on the population, sampling techniques, inclusion, and exclusion criteria above, 20 athletes or participants were obtained as samples. Data collection was carried out 3 times in one week with a total of 16 meetings. The participants were then analyzed through the characteristics of the sample data.

The characteristic of the sample data in this study is the average bleep test to measure the resistance of the sample. This refers to the principle of FITT (frequency, intensity, time, and type or model). In this study, the characteristics of the research sample of lemongrass and salt therapy can be seen in Table 1.

Table 1. Bleep Test Sample Data Characteristics

Variable	Group					
	Experiment (K_0) n = 9			Control (K_1) n = 7		
	Average	Min.	Max.	Average	Min.	Max.
Age (year)	16,1	16	17	16,4	16	17
Vo_2 Max ml/kg weight/minutes	26,0	26,0	32,6	26,0	26,0	37,1

Research Design

This research is quantitative research with a quasi-experimental type, which seeks to find the influence of certain variables on other variables under controlled conditions. The researcher used a quasi-experimental type of research because the control of variables was only carried out on one of the most dominant variables (Fraenkel et al., 2019). The design of this study used a pretest-posttest equivalent control group design model. This study compared two groups of different treatments. Group A (Experiment) is Therapy using a mixture of lemongrass and salt. Group B (Control) is active rest (as a recovery method). Both groups will have their recovery pulse measured before and after treatment (pretest-posttest), described in Table 2.

Table 2. Research Design

Group	Pretest	Treatment	Post test
Experiment	O_1	X_1 (Soak lemongrass legs and salt)	O_1
Control	O_2	X_2 (Active rest)	O_2

Note:
O_1 : Pulse measurement before treatment
X_1 : Treatment with foot soaking therapy mixture of lemongrass and salt water
X_2 : Active rest treatment (e.g., walking lightly during recovery time)
O_2 : Pulse measurement after treatment

Instruments

A research instrument is a measuring tool used to measure natural phenomena (research variables) and social phenomena observed. The research instruments used in this study include bleep test and heart rate monitor. Bleep test research instruments require equipment such as loudspeakers (radioactive), music beep tests, cones, meters, and stationery (Senanayake et al., 2024). The Bleep test has sufficient validity and reliability standards as a test (Mayorga-Vega et al., 2015). Heart rate monitor has sufficient validity and reliability standards as a test (Li et al., 2023). The moderator's heart rate data was collected in a sitting and resting condition three times measured on different days in the club or school environment.

Procedures

This research procedure is needed to ensure that the entire research series runs in accordance with the research flow that has been prepared. After obtaining the research sample, the researcher divided 2 groups with the ordinal pairing technique. Before the sample test was carried out, the resting pulse was measured with a heart rate monitor. Then the sample did a bleep test to measure

fitness level and reduce the maximum pulse. After completing the bleep test, the sample went to a warm pool with a mixture of lemongrass and salt prepared by the researcher for the treatment group (A) while the control group (B) took an active break (standing) to measure the recovery pulse (Figure 1).

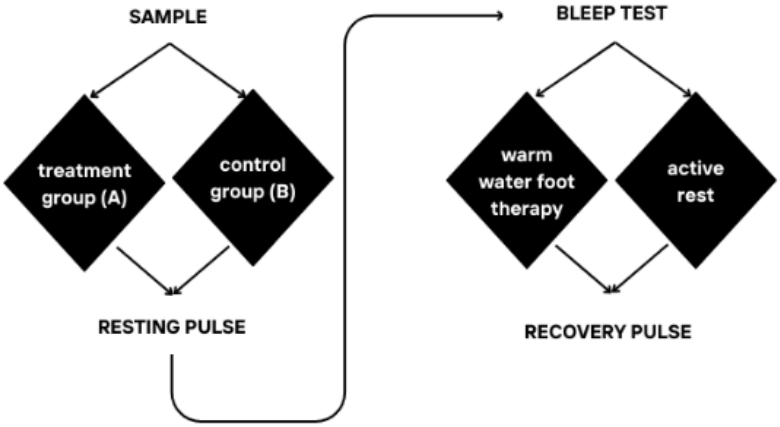

Figure 1. Research Procedure

The procedure for implementing the bleep test is arranged into 4 stages. Step One, Follow the instructions from the tape. After 5 bleep counts, test takers start running/jogging, from the first line to line 2. The running speed must be set constantly and exactly arrive at the line, then pivot to the origin line. If the test-taker has reached the line before the bleep sounds, the test-taker must wait behind the line, and only run again when the bleep sounds. And so on, test participants ran back and forth according to the rhythm of the bleep. The second stage, this back-and-forth run consists of several levels (levels). Each level consists of several shuttle, each level is marked with 3 bleeps (like the turalit mark), while each shuttle is marked with one bleep.

In the third stage, the test participant runs to the beat of the bleep until he is unable to keep up with the rhythm (at the time the bleep is heard, the test participant has not yet reached the line). If in 2 consecutive times the test taker fails in catching up with the bleep rhythm, then the test taker is considered incapable of taking the test, and he must stop. Fourth stage, cool down by walking, do not immediately stop/sit. Results and assessments are carried out by recording at the last level and shuttle, how much the test participants managed to complete according to the bleep rhythm. The bleep test is also to measure the prediction of VO2 max values. The score results are summarized on the form sheet provided.

Data Analysis

The data analysis of this research went through the hypothesis test stage. Before stepping into the hypothesis testing stage in this study, careful understanding and preparation is needed so that the results obtained truly reflect the actual conditions. There are prerequisite tests that must be met, including normality tests, homogeneity tests, paired t tests, and independent t test samples. prerequisite test analysis in this study, the data used were pretest data, posttest of the warm water therapy group with a mixture of lemongrass and salt, pretest, posttest of the control group with active rest and 3rd minute recovery pulse. the analysis carried out has several steps, including descriptive analysis, normality test, homogeneity test, dependent and independent t-test using SPSS 16.0.

The normality test is carried out to find out whether the data is normally distributed or not being analyzed. In this study, the Shapiro-Wilk Test was used with a significant level of 0.05 or 5%. The data is distributed normally if the p value > 0.05. The following are the results of the 3rd Minute Recovery Pulse Normality Test, in Table 3.

Table 3. Tests of Normality

3rd minute		Shapiro-Wilk		
		Statistic	df	Sig. (2-tailed)
Recovery Pulse Results	Pretest K_0	0,256	9	0,092
	Postest K_0	0,245	9	0,126

	Pretest K_1	0,258	7	0,174
	Postest K_1	0,203	7	0,200

Source: 2024 Research Data

The Homogeneity Test is carried out to determine whether the variance of data in the study is homogeneous (same) or not. The results of the homogeneity test of this research data can be seen from the results of the significance value. The data obtained had a homogeneous variance when (p> 0.05), the probability value was greater than the level of error. The results of the calculation of the homegenity test of the research data are presented in the Table 4.

Table 4. Homogeneity Test

Variable N= 16	Average Recovery Pulse (beats/minute)		Sig. (2-tailed)	Information
	Group Experiment (K_0)	Group Control (K_1)		
Posttest K_0 – K_1	108	121,7	0,896	Homogeneous

Source: 2024 Research Data

RESULTS AND DISCUSSION

Results

The results of this study occurred starting from the t-test analysis. The T-Test Paired Sample Test aims to find out whether there is an average difference between two paired samples, namely pretest and posttest data K_0 (lemongrass and salt therapy). The results of the recovery pulse difference test are presented in the following Table 5. This T-Test also aims to answer the formulation of the problem "Is there an effect of a mixture of lemongrass and salt for the restoration of the original pulse in pencak silat athletes aged 14-17 years?

Table 5. Paired Test Sample T-Test

Variable N= 16	Pulse Rate Recovery (beats/minutes)		Sig. (2-tailed)	Information
	Pretest	Posttest		
Experiment (K_0)	112,8	108	0,03	There are Differences
Control (K_1)	123,4	121,7	0,2	No Difference

Source: 2024 Research Data

The Independent Sample T-Test aims to find out if there is an average difference between two unpaired samples. This test also aims to answer the formulation of the problem "Is there a difference in the speed of recovery of the original pulse with a mixtureof lemongrass and salt in pencak silat athletes aged 14-17 years with active rest in pencak silat athletes aged 14-17 years?" To answer the formulation of the problem above, the independent t-test was carried out on posttest K_0 (lemongrass and salt) and posttest K_1 (active sitting). The results of the Independent T-Test data are presented by the following Table 6.

Table 6. Independent T-Test

Variable N=20	Average Recovery Pulse (beats/minute)		Sig. (2-tailed)	Information
	Group Experiment (K_0)	Group Control (K_1)		
Posttest K_0 – K_1	108	121,7	0,000	There is a difference

Source: 2024 Research Data

The difference in recovery pulse efficiency between the groups showed interesting findings. The analysis showed that there was a significant difference in the average recovery pulse rate

between the groups studied. This finding illustrates that the body's response to activity and its recovery can vary depending on the conditions or treatment received from 1 to 5 minutes (Figure 2).

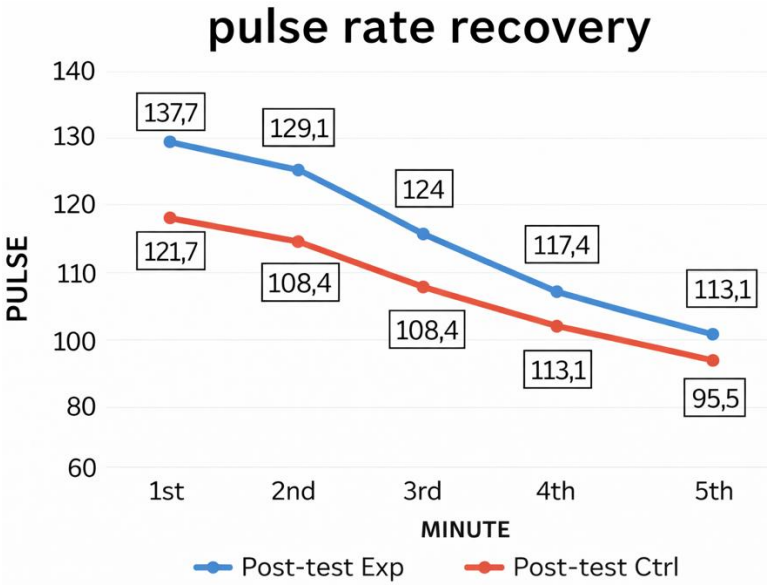

Figure 2. Average DN Recovery Per-minute
Source: 2024 Research Data

Research results related to the original pulse effect test (Table 7), analyzing research questions namely "Is there an influence of physical therapy media: a mixture of lemongrass and salt for the restoration of the original pulse in pencak silat athletes aged 14-17 years?"

Table 7. Original Pulse Effect Test

Variable n=16	Pre-test	Post-test	Sig. (2-tailed)	Information
$K_0 - K_1$	112,8 bpm	108 bpm	0,03	There is an influence

Based on the explanation of the data of the K_0-K_1 group (lemongrass and salt) there is an average difference, then H_0 is rejected, and Ha is accepted, and it can be concluded that there is an influence of recovery pulse for the lemongrass and salt pretest and the lemongrass and salt posttest in pencak silat athletes aged 14-17 years.

Research results related to the original pulse effect test (Table 8), analyzing research questions namely "Is there a difference in the efficiency of physical therapy media: a mixture of lemongrass and salt for the restoration of the original pulse in pencak silat athletes aged 14-17 years?

Table 8. Pulse diffrence test between groups

Variable n=16	Pre-test	Post-test	Sig. (2-tailed)	Information
$K_0 - K_1$	108 bpm	121,7 bpm	0,000	There is a influence

Based on the results above (Table 8), the posttest of lemongrass and salt with an active posttest of 0.000 < 0.05, then H_0 is rejected, and Ha is accepted, and it can be concluded that there is a difference in the average pulse result of recovery therapy method lemongrass and salt therapy method with active rest in Pencak Silat Athletes Tri Tunggal Jati.

Research results related to the original pulse effect test (Table 9), analyzing research questions namely "Is there a difference in the efficiency of physical therapy media:a mixture of lemongrass and salt for the restoration of the original pulse in pencak silat athletes aged 14-17 years?"

Table 9. Pulse Efficiency Restored Original

Pulse	Treatment	Control	Δ
3 minutes	108,4 bpm	121,7 bpm	13,3 bpm

Based on the results above (Table 9), There was a significant difference in the 3rd minute pulse data, where the results of the lemongrass and salt posttest and the active rest control posttest were 108.4 and 121.7 beats/minute, with a difference of 13.3 beats/minute. Heart rate should be below 120, after 2-5 minutes after exercise depending on fitness level (Franklin et al., 2022). In the experimental posttest group, the average pulse rate in the 3rd minute was below 120 beats/minute, while in the control posttest group, the average pulse rate was below 120 beats/minute in the 4th minute. Based on this theory, it can be concluded (for this research) that the speed of recovery with the 1-minute salt water and lemongrass therapy method is more efficient than the active rest method in pencak silat athletes.

Discussions

Based on the results of interpreting the data from the original recovered pulse rate in the pre-test and post-test of 112.8 bpm and 108.4 bpm, it can be concluded that there is an influence and difference in the pulse of the origin of physical therapy media: a mixture of lemongrass and salt for the recovery of the original pulse in pencak silat athletes aged 14-17 years. Recovery pulse can be categorized as normal if it is below 120 beats/minute (Bazyar et al., 2019).

Warm water provides physiological effects for the body, especially in improving blood circulation due to temperature that increases the dilation of blood vessels. In addition, water pressure provides a load that helps strengthen the muscles and ligaments around the joints. Salt containing sodium and sodium plays an important role in maintaining the balance of body fluids, nerve transmission, and muscle function (Bayram & Ozturkcan, 2021; Veniamakis et al., 2022).

This study has an element of novelty because it examines the effectiveness of physical therapy media in the form of a mixture of lemongrass and salt as an alternative method to accelerate the recovery of the original pulse in pencak silat athletes aged 14–17 years, which until now has been rarely studied scientifically, especially in the context of pencak silat sports. This approach combines natural physiotherapy principles with the potential of lemongrass bioactive compounds and salt electrolyte content, making a new contribution to the recovery management of adolescent athletes in a non-invasive and easy-to-apply manner.

Then based on the results of the interpretation of the data from the study, the average pulse rate of the 3rd minute treatment group was below 120 bpm, while the pulse rate recovered if the average control group was below 120 bpm at the 4th minute, so that the combination therapy of lemongrass and salt was more effective by 1 minute than active rest therapy for recovered pulse from pencak silat athletes aged 14-17 years.

Everyone's endurance is different, one way to measure a person's endurance is by aerobic exercise by paying attention to the FITT (Frequency, Intensity, Time, Type) principle. The heart rate should be below 120, after 2-5 minutes after exercise depending on the fitness level. If the heart rate is higher, insufficient cooling or fitness levels may be the cause (Périard et al., 2021).

Previous studies have shown a significant difference (p-value 0.000 ≤ 0.05) in the therapeutic effects of soaking feet with warm water mixed with salt and lemongrass. This therapy has been shown to influence changes in blood pressure. The results show that the combination of warm water, salt, and lemongrass can help lower blood pressure. These findings reinforce the potential of such natural mixtures as non-pharmacological therapies (la Torre et al., 2023; Wang et al., 2025).

Implications

The findings of this study have important practical and theoretical implications for sports recovery management, particularly in combat sports such as pencak silat that demand high cardiovascular and neuromuscular loads. The demonstrated effectiveness of lemongrass and salt mixture therapy in accelerating pulse recovery suggests that natural, low-cost, and culturally familiar interventions can be integrated into post-exercise recovery protocols without compromising physiological outcomes. For coaches, physical therapists, and sport practitioners, this approach offers a feasible alternative or complementary strategy to conventional recovery methods, especially in

training environments with limited access to modern recovery technologies. Moreover, the faster return of heart rate toward baseline indicates potential benefits for training continuity, reduced fatigue accumulation, and improved readiness for subsequent training sessions.

Research Contribution

This study contributes to the field of sports science and physical therapy by providing empirical evidence on the effectiveness of a combined herbal–mineral therapy for cardiovascular recovery in adolescent athletes. Unlike previous studies that focused on single recovery modalities such as passive rest, active recovery, or isolated aromatherapy, this research introduces a novel integration of lemongrass bioactive compounds and salt-based electrolyte mechanisms within a warm-water therapy context. By situating this intervention within the specific physiological demands of pencak silat athletes, the study enriches the literature on culturally grounded and evidence-based recovery strategies. Furthermore, the findings expand current understanding of non-pharmacological recovery interventions, supporting the role of natural therapies in enhancing post-exercise physiological regulation.

Limitations

Despite its contributions, this study has several limitations that should be carefully considered when interpreting the results. First, the relatively small sample size and the restriction to female athletes aged 14–17 years from a single pencak silat club limit the generalizability of the findings to broader athletic populations. Second, environmental factors such as water temperature stability and variations in individual recovery capacity may have influenced the recovery pulse outcomes. Third, the study focused primarily on short-term pulse recovery and did not assess other relevant recovery indicators such as heart rate variability, blood lactate concentration, or subjective fatigue perception. These limitations suggest that the results should be interpreted cautiously and viewed as an initial step toward broader investigation rather than definitive conclusions.

Suggestions

Based on the findings and limitations of this study, future research is encouraged to employ larger and more diverse samples, including different age groups, genders, and types of sports, to enhance external validity. Further studies should also examine variations in therapy parameters, such as water temperature, soaking duration, and the concentration of lemongrass and salt, to identify optimal recovery protocols. In addition, incorporating physiological and perceptual recovery indicators, such as heart rate variability, muscle soreness, and perceived exertion, would provide a more comprehensive understanding of recovery mechanisms. Longitudinal research designs are also recommended to explore the long-term effects of repeated use of natural recovery therapies on athletic performance, injury prevention, and overall training adaptation.

CONCLUSION

Based on the results, analysis, and discussion, this study concludes that (1) the physical therapy method using a mixture of lemongrass and salt has a significant effect on pulse recovery in pencak silat athletes of Tri Tunggal Jati Kebumen, as evidenced by a clear difference when compared with the active rest method, indicating that this natural intervention more effectively facilitates the return of heart rate toward baseline conditions following intensive exercise, and that (2) the lemongrass and salt therapy is more efficient than active rest, as it accelerates pulse recovery by approximately one minute, reflecting a faster restoration of cardiovascular homeostasis and highlighting the practical advantage of this therapy in supporting athletes' readiness for subsequent training activities.

The coherence between the research objectives stated in the Introduction and the empirical evidence presented in the Results and Discussion chapters confirms the internal consistency and scientific relevance of this study. Beyond statistical significance, the findings underscore the value of natural, accessible, and culturally appropriate recovery strategies that can be comfortably integrated into routine training programs, particularly in martial arts settings with limited access to advanced recovery technologies.

Several limitations should be acknowledged in interpreting these findings. Practical challenges related to the preparation of soaking facilities in rocky environments and the maintenance of stable

water temperature may have influenced the consistency of the intervention. Nevertheless, this study provides a strong foundation for future research. Further investigations are encouraged to examine variations in water temperature, therapy duration, and composition, as well as to include additional comparison groups employing modern recovery modalities. Moreover, the application of more standardized pulse measurement procedures and improved environmental control will enhance methodological rigor and broaden the applicability of this therapeutic approach across different sports contexts.

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AUTHOR CONTRIBUTION STATEMENT

KI conceptualized the study, designed the research methodology, conducted data collection, performed statistical analysis, and drafted the original manuscript. RPB contributed to the theoretical framework development, critically reviewed and refined the manuscript for intellectual content, and provided academic supervision throughout the research process. Both authors reviewed, approved the final version of the manuscript, and agreed to be accountable for all aspects of the work.

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