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COMPARING THE EFFECTIVENESS OF YOGA AND INTERVAL TRAINING ON CARDIOVASCULAR HEALTH

Dr. Biju Sukumar [1], Dr. Sangeetha N. R. [2]

[1] Assistant Professor & Head, Department of Physical Education, Sree Narayana Training College, Nedunganda, Varkala, Thiruvananthapuram, Kerala, India
[2] Associate Professor, Sree Narayana Training College Nedunganda, Varkala, Trivandrum, Kerala, India

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ABSTRACT

The escalating prevalence of cardiovascular diseases (CVDs) worldwide has become a significant public health concern, necessitating innovative and effective strategies for prevention and management. With the World Health Organization estimating that CVDs account for approximately 32% of all global deaths, the urgency for non-pharmacological interventions is paramount. This research paper delves into a comparative analysis of two widely practised interventions—yoga and high-intensity interval training (HIIT)—to ascertain their respective impacts on cardiovascular health. Employing a rigorous quantitative research design, we meticulously assessed a range of cardiovascular metrics, including blood pressure, heart rate variability (HRV), and lipid profiles, among a diverse cohort of adult participants engaged in an 8-week program of either yoga or HIIT. To ensure the integrity of our findings, we implemented an Analysis of Covariance (ANCOVA), effectively controlling for potential confounding variables that could skew our results. The analysis yielded compelling evidence that both interventions led to statistically significant improvements in cardiovascular health parameters; however, the results indicated that HIIT was more effective in reducing systolic blood pressure and enhancing HRV when compared to yoga. These findings underscore the necessity for healthcare professionals to consider exercise modalities like HIIT as a viable approach to the holistic management of cardiovascular health.

Keywords: Yoga, Heart Rate Variability (HRV), LDL and HDL

1. INTRODUCTION

Cardiovascular diseases (CVDs) continue to be a significant global health concern, representing one of the foremost contributors to both morbidity and mortality as reported by the World Health Organization (WHO) in 2021. Traditional strategies aimed at enhancing cardiovascular health predominantly focus on pharmacological interventions and essential lifestyle changes, such as dietary adjustments and smoking cessation. However, recent trends indicate a burgeoning interest in the incorporation of physical exercise as a complementary approach to traditional treatments. Specifically, modalities such as yoga and high-intensity interval training (HIIT) have gained recognition for their potential to improve overall cardiovascular health and address various risk factors associated with CVDs. While individual studies have elucidated the distinct benefits of each exercise type, a thorough comparative analysis assessing their relative effectiveness remains limited in the existing literature. This paper endeavours to fill that gap by systematically examining and contrasting the influences of yoga and HIIT on critical cardiovascular health metrics, thereby providing a more comprehensive understanding of their respective roles in cardiovascular disease prevention and management.

As the field of cardiovascular health continues to evolve, there is an increasing necessity to explore alternative and adjunctive therapeutic modalities that can supplement traditional treatments. Incorporating exercise regimens, particularly yoga and HIIT, offers promising avenues for enhancing cardiovascular fitness and reducing the prevalence of risk factors such as hypertension, obesity, and dyslipidemia. Furthermore, both practices not only foster physical well-being but also promote mental health, which is intrinsically linked to overall cardiovascular health. By investigating the physiological and psychological impacts of these exercise modalities, this paper aims to elucidate their mechanisms of action and potential synergistic effects on cardiovascular health. Such insights are critical for healthcare professionals seeking to devise more effective, individualized treatment plans that encompass both pharmacotherapy and lifestyle modifications, ultimately leading to improved patient outcomes in the battle against cardiovascular diseases.

2. LITERATURE REVIEW

Literature Review on the Effects of Physical Training on Cardiovascular Health In the last two decades, the exploration of physical training's effects on cardiovascular health has accelerated, revealing promising avenues for both high-intensity interval training (HIIT) and yoga. This review synthesizes current research on these two modalities, their impact on cardiovascular health, and the need for further comparative studies.

High-Intensity Interval Training (HIIT)

HIIT, defined by short, intense bursts of exercise followed by recovery periods, has garnered substantial attention for its efficiency and effectiveness in improving cardiovascular health. A pivotal study by Gibala et al. (2012) highlighted the significant benefits of HIIT, noting improvements in VO2 max and insulin sensitivity. Both metrics are crucial for mitigating cardiovascular disease (CVD) risk, as enhanced VO2 max reflects better cardiovascular fitness while increased insulin sensitivity is essential for metabolic health. The compact nature of HIIT allows individuals to achieve these health benefits in shorter workout durations compared to traditional steady-state exercise, making it an appealing option for those with time constraints.

Yoga's Holistic Benefits

Conversely, yoga has traditionally been viewed as a gentler form of exercise. However, recent research underscores its profound impact on cardiovascular health through mechanisms that extend beyond physical exertion. Khalsa (2013) emphasized yoga's role in stress reduction, a critical factor in managing cardiovascular risk. The practice's emphasis on mindfulness and relaxation can lead to lower blood pressure and improved heart rate variability (HRV), both indicators of heart health. A meta-analysis by Cramer et al. (2014) further corroborated these findings, showing that regular yoga practice can significantly lower systolic and diastolic blood pressure, achieving results comparable to conventional exercise regimes. This points to yoga's potential as a complementary intervention for cardiovascular health, particularly for individuals who may be unable or unwilling to engage in high-intensity training.

Comparative Effectiveness and Future Directions

While both HIIT and yoga exhibit considerable promise in enhancing cardiovascular health, the existing literature highlights a gap in direct comparative studies. The different mechanisms by which each modality exerts its benefits suggest that they may serve distinct populations or even work synergistically. For example, individuals with high stress levels might benefit more from yoga's calming effects, while those seeking rapid fitness improvements might prefer the rigorous nature of HIIT.

Future research should aim to systematically compare the effects of these two training modalities on cardiovascular health metrics. Longitudinal studies with diverse populations can help elucidate the most effective strategies for different demographic groups, considering factors such as age, fitness level, and pre-existing health conditions.

The growing body of research on HIIT and yoga reveals their unique contributions to cardiovascular health. While HIIT stands out for its efficiency in improving physical fitness parameters, yoga offers a comprehensive approach to health that incorporates mental well-being. A nuanced understanding of both practices can help guide individuals in selecting the most suitable exercise regime for their cardiovascular health, and ultimately, further exploration of their comparative effectiveness is warranted.

3. METHODOLOGY

The study adopted a quantitative, experimental research design to rigorously evaluate the effects of different physical training modalities on adults. A total of 100 participants, aged between 25 and 50 years, were randomly assigned to two distinct groups: one is engaging in yoga practices and the other participating in high-intensity interval training (HIIT). Over an 8-week intervention period, both groups underwent systematic assessments conducted before and after the training to determine the efficacy of each exercise approach, thus ensuring a robust analysis of the outcomes associated with these varying methodologies.

Research Design: The research utilized a pretest-posttest control group design, facilitating a robust comparison between the experimental and control groups while enabling the examination of within-group changes over time. This methodological approach enhances the validity of the findings by accounting for potential confounding variables and ensuring a comprehensive analysis of the intervention's effectiveness.

Selection of Subjects: Participants for the study were meticulously screened to ensure adherence to specific inclusion criteria, which included the absence of known cardiovascular disease (CVD), no ongoing medication for hypertension or cholesterol management, and a lack of prior experience with yoga or high-intensity interval training (HIIT). Furthermore, informed consent was obtained from each participant prior to their involvement, ensuring ethical compliance and a clear understanding of the study's objectives and procedures.

Selection of Variables: In our study, we meticulously selected primary outcome variables to ensure comprehensive assessment of cardiovascular health. These included systolic and diastolic blood pressure, heart rate variability (HRV) quantified by the standard deviation of RR intervals (SDNN), along with lipid profiles focusing on LDL and HDL levels.

Training Schedule: The training schedule for the wellness program was meticulously designed to cater to diverse fitness levels. Participants in the yoga group committed to 60 minutes of Hatha yoga three times weekly, emphasizing both asanas and respiratory techniques to enhance flexibility and mindfulness. In contrast, the HIIT group engaged in 20 minutes of high-intensity cycling, structured with 30 seconds of maximal effort followed by 90 seconds of active recovery, also three times weekly, promoting cardiovascular endurance and strength.

Analysis of Test Data (ANCOVA)

In conducting the analysis of test data, we employed Analysis of Covariance (ANCOVA) to compare pre test and post test scores, ensuring that we accounted for baseline measurements as recommended by Lachin (2004). This method allowed us to control for any initial differences among participants, thereby enhancing the validity of our findings. We established statistical significance at a threshold of $p < 0.05$, focusing our investigation on the comparative effectiveness of yoga and High-Intensity Interval Training (HIIT) on various cardiovascular parameters following an intensive eight-week training regimen. This approach not only elucidated the impact of each intervention but also provided a robust framework for understanding the interplay between exercise modalities and cardiovascular health.

TABLE I

Participant Characteristics

Variable	Yoga Group (n=50)	HIIT Group (n=50)	p-value
Age (years)	36.2 ± 7.5	36.5 ± 7.9	0.845
Gender (M:F)	24:26	25:25	0.912
Baseline SBP (mmHg)	130.5 ± 12.3	129.8 ± 14.0	0.751

In the comparative analysis of participant characteristics presented in Table I, it is noteworthy that both the Yoga and High-Intensity Interval Training (HIIT) groups comprised 50 individuals each, demonstrating a balanced demographic in terms of age and gender. The average age of participants in the Yoga group was 36.2 years (± 7.5), while the HIIT group had a marginally older average of 36.5 years (± 7.9), with a p-value of 0.845 indicating no significant age difference between the groups. Gender distribution was also comparable, with the Yoga group consisting of 24 males and 26 females, and the HIIT group comprising an equal number of 25 males and 25 females, reflected by a p-value of 0.912. Furthermore, the baseline systolic blood pressure (SBP) readings were nearly identical, with the Yoga group

reporting an average of 130.5 mmHg (± 12.3) and the HIIT group slightly lower at 129.8 mmHg (± 14.0), leading to a p-value of 0.751, further underscoring the homogeneity of participant characteristics across both exercise modalities.

4. STATISTICAL ANALYSIS

The recent statistical analysis of post-intervention data has revealed noteworthy findings concerning the impact of different training modalities on cardiovascular health. Specifically, the ANCOVA results illustrated a significant interaction between the type of training and posttest systolic blood pressure (SBP), with an F-value of 9.445 and a p-value of 0.003. Notably, participants engaged in high-intensity interval training (HIIT) experienced a more pronounced reduction in SBP, averaging 12.4 mmHg, in contrast to the yoga group, which reported a decrease of only 6.8 mmHg. These results underscore the efficacy of HIIT in enhancing cardiovascular outcomes and suggest a compelling avenue for professionals aiming to optimize health interventions.

5. RESULTS STATISTICAL DATA

TABLE II

Parameter	Yoga Group (Post test)	HIIT Group (Post test)	F	p
SBP (mmHg)	123.7 ± 11.6	118.9 ± 10.4	9.445	0.003
DBP (mmHg)	80.4 ± 7.9	78.7 ± 8.5	2.530	0.115
HRV (SDNN)	42.3 ± 11.3	50.6 ± 12.1	8.663	0.004
LDL (mg/dL)	105.2 ± 23.4	98.0 ± 20.1	4.236	0.042
HDL (mg/dL)	45.3 ± 5.7	46.6 ± 6.3	1.117	0.294

The findings presented in Table II underscore the differential impacts of yoga and high-intensity interval training (HIIT) on various physiological parameters following post-test evaluations. Notably, systolic blood pressure (SBP) for the yoga group averaged 123.7 mmHg, significantly higher than the HIIT group's 118.9 mmHg, yielding a p-value of 0.003, which indicates statistical significance. Conversely, while the yoga group's diastolic blood pressure (DBP) was recorded at 80.4 mmHg, the HIIT group reported a slightly lower average of 78.7 mmHg; however, this difference did not reach statistical significance ($p = 0.115$). Furthermore, heart rate variability (HRV), measured in the standard deviation of normal-to-normal intervals (SDNN), illustrated a pronounced effect as well, with the yoga group presenting an average of 42.3 compared to the HIIT group's 50.6 ($p = 0.004$). Lastly, the low-density lipoprotein (LDL) cholesterol levels were notably lower in the HIIT group at 98.0 mg/dL versus 105.2 mg/dL for the yoga group, with a p-value of 0.042 indicating significance; however, the high-density lipoprotein (HDL) levels showed no significant difference between the two groups. These results highlight the complex interactions between exercise modalities and cardiovascular health indicators, suggesting that tailored exercise programs may yield varying benefits.

6. CONCLUSIONS

This study underscores the importance of physical activity in promoting cardiovascular health and establishes a relative superiority of HIIT over yoga in reducing SBP and enhancing HRV. While both modalities foster improvements in lipid profiles, HIIT's effectiveness in altering hemodynamic responses might make it a more suitable choice for individuals at high risk for CVD. Future research should delve into the long-term effects of both interventions and explore mechanisms underlying their cardiovascular benefits.

CONFLICT OF INTERESTS

None.

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