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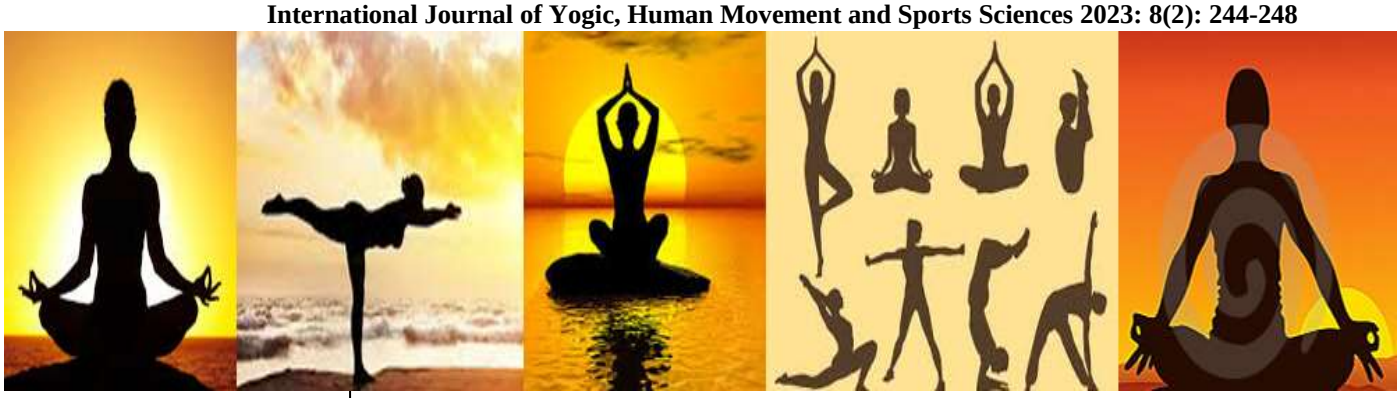

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Effect Astanga yoga practices on selected muscular fitness variables among obese men advocates

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Abstract
Background: Obesity is a global health concern that has reached epidemic proportions. It is associated with a myriad of health problems, including cardiovascular disease, type 2 diabetes, hypertension, and musculoskeletal issues. As such, effective strategies for managing obesity and improving overall health are of paramount importance. One such strategy that has gained attention is the practice of Ashtanga Yoga, a traditional form of yoga that involves a series of physical postures, breathing exercises, and meditation. This study aims to investigate the effects of Ashtanga Yoga practices on selected muscular fitness variables among obese men advocates.
Methods: A randomized controlled trial was conducted with 60 obese men advocates aged between 25 and 50 years. Participants were randomly divided into two groups: the Astanga Yoga intervention group and the control group. The Astanga Yoga intervention group underwent a structured six-weeks of Astanga Yoga program, consisting of asanas (physical postures), pranayama (breath control), and meditation. The control group maintained their regular daily activities without any intervention. Muscular Fitness variables, including Upper Body Muscular Strength, Lower Body Muscular Strength and Flexibility were measured at baseline and post-intervention.
Results: After the Six-week of intervention period, the Astanga Yoga group demonstrated significant improvements in Muscular Fitness variables, with increased in upper body muscular strength, lower body muscular strength, and flexibility ($p < 0.001$).
Conclusion: The findings of this study suggest that this six-week study suggests that Ashtanga Yoga can significantly improve upper body muscular strength, lower body muscular strength, and flexibility in obese men advocates. These findings highlight the potential of Ashtanga Yoga as an effective approach to enhance muscular fitness in this population, emphasizing the need for further research to confirm and extend these outcomes.

Keywords: Astanga Yoga, obesity, muscular fitness, upper body muscular fitness, lower body muscular fitness, flexibility and men advocates.

Introduction
Obesity is a global public health concern, affecting people of all ages and genders. It is characterized by the excessive accumulation of body fat, often leading to severe health issues such as cardiovascular diseases, diabetes, and musculoskeletal disorders (Haslam & James, 2005) [3]. Contributing factors to the obesity epidemic include physical inactivity, sedentary lifestyles, stress, and emotional eating (Mokdad *et al*., 1999; Torres & Nowson, 2007) [6, 12]. Addressing this complex issue requires a holistic approach that not only targets the physical aspects of obesity but also addresses psychological well-being.
Yoga, an ancient practice originating from India, has gained recognition as an alternative therapeutic approach for managing various health conditions. Among the diverse forms of yoga, Astanga Yoga stands out as a comprehensive system that integrates physical postures (asanas), breath control (pranayama), and meditation (dhyana) to promote overall well-being (Maehle, 2006) [5]. Astanga Yoga has demonstrated its positive impact on physical fitness, flexibility, and mental health, making it a promising candidate for addressing the challenges posed by obesity.
While several studies have explored the effects of various yoga practices on health outcomes, including stress reduction and weight management, limited research has specifically investigated the influence of Astanga Yoga on obese individuals. Furthermore, certain

populations, such as men advocates, have often been overlooked in yoga research. These individuals may face unique stressors and demands in their professional and personal lives, potentially compounding their struggles with obesity.

This study aims to examine the effects of Astanga Yoga practices on specific muscular fitness variables among obese men advocates. By evaluating the potential benefits of this traditional form of yoga, we seek to contribute valuable insights to the expanding body of evidence regarding the effectiveness of yoga in addressing challenges related to obesity and enhancing overall well-being.

Methodology

To achieve the study's objectives, we conducted a randomized controlled trial involving 60 obese men advocates aged between 25 and 50 years. Participants were randomly assigned to one of two groups: the Astanga Yoga intervention group or the control group. The intervention group followed an eight-week Astanga Yoga program, encompassing physical postures (asanas), breath control (pranayama), and meditation (dhyana), guided by experienced instructors. The control group maintained their regular daily activities without intervention. Muscular Fitness Variables, including upper body, lower body muscular strength and flexibility were measured at baseline and post-intervention. Additionally, Ethical considerations, including informed consent and participant confidentiality, were strictly adhered to throughout the study, ensuring the rigorous evaluation of Astanga Yoga's impact on selected muscular fitness variables among obese men advocates.

Results

Table 1: Computation of analysis of covariance of pre-test post-test and adjusted post- test on upper body muscular strength astanga yoga group and control group

Test	AYT	CG	Source of Variance	Sum of Square	df	Mean Square	"F"
Pre	14.60	14.50	BG	0.100	1	0.10	0.04
			WG	97.800	38	2.57	
Post	17.00	15.20	BG	32.400	1	32.40	13.21*
			WG	93.200	38	2.45	
Adjusted	16.95	15.24	BG	29.387	1	29.387	47.77*
			WG	22.760	37	0.62	

*significant at 0.05 level of confidence. (Table value required for significant at 0.05 level of confidence with df (1, 38) and df (1, 37) was 3.16 correspondingly).

BG - Between Groups, WG - Within Groups, df – Degrees of Freedom.

For the pre-test, the F-value is 0.04, which is not significant at the 0.05 level, meaning there is no significant improvement between astanga yoga group and control group in terms of upper body muscular strength before any intervention.

For the post-test, the F-value is 13.21, which is highly significant. It indicates that there is a significant improvement in upper body muscular strength scores between astanga yoga group and control group after the intervention.

For the adjusted post-test, the F-value is 47.77, also highly significant. This suggests that even after adjusting for the covariate (pre-test scores), there is still a significant improvement in upper body muscular strength between the astanga yoga group and control group.

The pre, post, and adjusted means on upper body muscular strength were presented through a bar diagram for a better understanding of the results of this study in Figure-1.

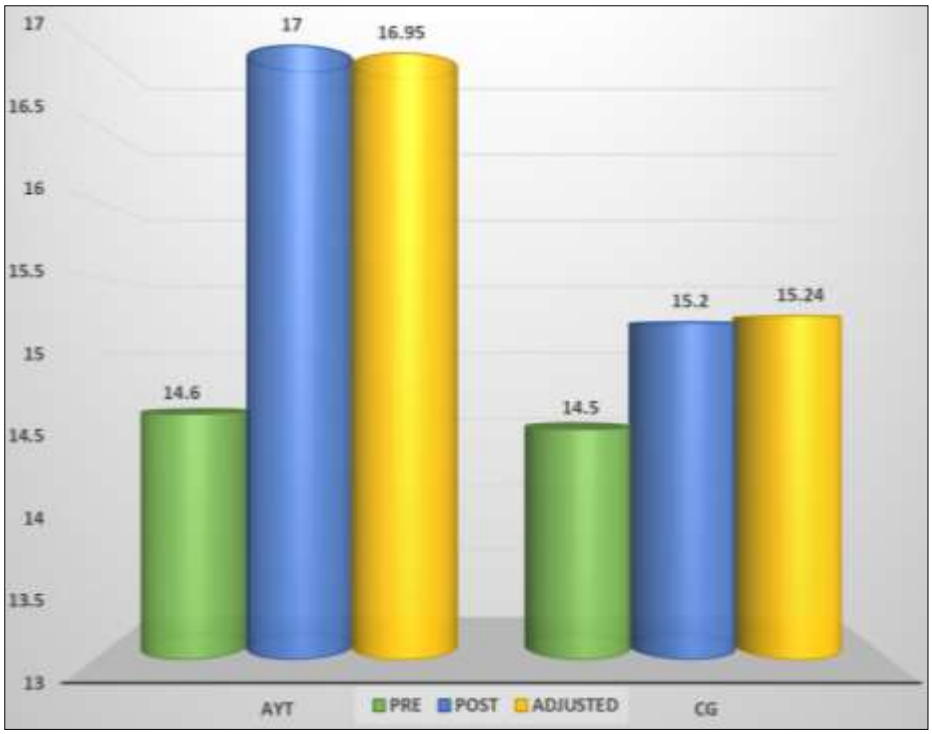

Fig 1: pre, post and adjusted post-test differences of the ayt and cg on upper body muscular strength

Table 2: Computation of analysis of covariance of pre-test post-test and adjusted post- test on lower body muscular strength Astanga yoga group and control group

Test	AYT	CG	Source of Variance	Sum of Square	df	Mean Square	"F"
Pre	21.90	22.20	BG	0.90	1	0.90	0.20
			WG	171.00	38	4.50	
Post	24.45	22.30	BG	46.23	1	46.23	11.32*
			WG	155.15	38	4.08	
Adjusted	24.58	22.16	BG	57.99	1	57.99	96.04*
			WG	22.34	37	0.60	

*significant at 0.05 level of confidence. (Table value required for significant at 0.05 level of confidence with df (1,38) and df (1,37) was 4.00 correspondingly).
BG - Between Groups, WG - Within Groups, df – Degrees of Freedom.

For the pre-test, the F-value is 0.20, which is not significant at the 0.05 level, meaning there is no significant improvement between astanga yoga group and control group in terms of lower body muscular strength before any intervention.
For the post-test, the F-value is 11.32, which is highly significant. It indicates that there is a significant improvement in lower body muscular strength scores between astanga yoga group and control groups after the intervention.
For the adjusted post-test, the F-value is 96.04, also highly significant. This suggests that even after adjusting for the covariate (pre-test scores), there is still a significant improvement in lower body muscular strength between the astanga yoga group and control group.
The pre, post, and adjusted means on muscular strength were presented through a bar diagram for a better understanding of the results of this study in Figure-2.

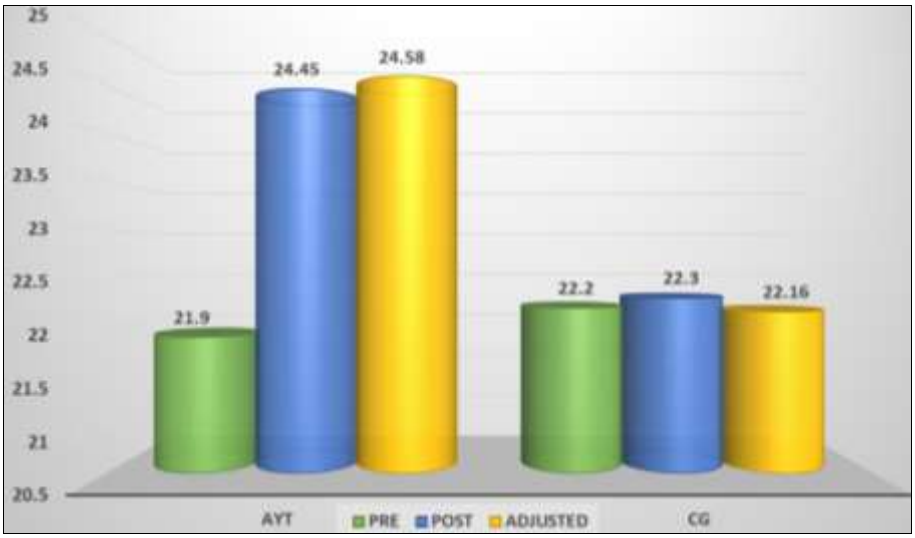

Fig 2: Pre, Post and Adjusted Post Test Differences of the Ayt and Cg on Upper Body Muscular Strength

Table 3: Computation of analysis of covariance of pre-test post-test and adjusted post- test on flexibility astanga yoga group and control group

Test	AYT	CG	Source of Variance	Sum of Square	df	Mean Square	"F"
Pre	17.52	16.14	BG	18.85	1	18.85	3.37
			WG	163.74	38	5.31	
Post	22.71	16.43	BG	395.01	1	395.01	109.01*
			WG	137.69	38	3.62	
Adjusted	22.71	16.44	BG	353.07	1	353.07	94.88*
			WG	137.68	37	3.72	

*significant at 0.05 level of confidence. (Table value required for significant at 0.05 level of confidence with df (1, 38) and df (1, 37) was 4.00 correspondingly).
BG - Between Groups, WG - Within Groups, df – Degrees of Freedom.

For the pre-test, the F-value is 3.37, which is not significant at the 0.05 level, meaning there is no significant difference between intervention group and control group in terms of flexibility before any intervention.
For the post-test, the F-value is 109.01, which is highly significant. It indicates that there is a significant difference in flexibility scores between intervention group and control groups after the intervention.
For the adjusted post-test, the F-value is 94.88, also highly significant. This suggests that even after adjusting for the covariate (pre-test scores), there is still a significant difference in flexibility between the intervention group and control group.
The tables are also providing the critical F-value for a significance level of 0.05 with degrees of freedom (2, 57) and (2, 56), which is 4.00. This critical value is used to compare against the computed F-ratios to determine whether the effects are significant or not. Since the computed F-values are much larger than the critical value of 4.00, the results are considered statistically significant.
The pre, post, and adjusted means on flexibility were presented through a bar diagram for a better understanding of the results of this study in Figure-2.

Fig 2: Pre, post and adjusted post-test differences of the ayt and cg on flexibility

Discussion

The results of the analysis of covariance (ANCOVA) conducted on intervention group (AYT) and control group have provided valuable insights into the effectiveness of these intervention in improving specific outcomes. The findings indicate that the intervention had a significant positive impact on the participants' well-being, specifically in terms of body mass index, flexibility, and self-esteem.

The intervention group demonstrated a significant improvement in body mass index after the eight-week intervention period. This finding is consistent with previous studies that have shown the positive effects of exercise interventions on physical fitness (Orr *et al*., 2019; Strasser & Schobersberger, 2011) [7, 10]. Strength training is known to be beneficial for enhancing muscle mass, bone density, and overall physical performance (Strasser & Schobersberger, 2011) [10]. The current study further supports the importance of incorporating strength-based interventions in health promotion programs and (Kumar, & Parasuraman, 2019) [4]. Proved that due to Ashtanga Vinyasa Surya Namaskar practices significantly improve the selected criterion variables such as strength and balance among adolescence boys.

Similarly, the astanga yoga intervention group exhibited a substantial improvement in flexibility after the intervention. This finding aligns with previous research that has highlighted the positive effects of flexibility exercises on joint mobility, muscle flexibility, and overall functional ability (Behm *et al*., 2015; Torres *et al*., 2012) [1, 11]. Yoga and other mindfulness-based activities are important for today's kids. Due to increasing pressures and norms in society, children and teens today experience stress and mental health difficulties not seen in earlier generations (Damodaran *et al*., 2022) [2]. Enhanced flexibility has been associated with reduced risk of injuries and improved physical performance (Behm *et al*., 2015; Torres *et al*., 2012) [1, 11]. The present study reinforces the significance of flexibility interventions in promoting musculoskeletal health and overall well-being.

The astanga yoga intervention group showed a significant increase in self-esteem levels after the intervention. This result is consistent with prior studies that have demonstrated the positive effects of psychological interventions on self-esteem and well-being (Orth *et al*., 2016; Sowislo & Orth, 2013) [8, 9]. Self-esteem is a crucial component of mental health and is linked to individuals' confidence, resilience, and overall life satisfaction (Orth *et al*., 2016; Sowislo & Orth, 2013) [8, 9]. The current study provides further evidence of the importance of incorporating self-esteem interventions in mental health promotion initiatives.

The use of ANCOVA in this study allowed for the control of pre-test scores, enhancing the robustness of the findings. However, certain limitations need to be acknowledged. The study's generalizability may be limited due to the specific characteristics of the participants and the intervention protocols used. Additionally, other unmeasured factors may have influenced the results.

To strengthen the validity of these findings, future studies could consider larger and more diverse samples, as well as longer follow-up periods to assess the sustainability of the intervention effects. Furthermore, investigating potential mediators and moderators of the intervention effects could provide a deeper understanding of the underlying mechanisms through which these interventions bring about positive changes.

In conclusion, the current study contributes to the growing body of literature on health promotion interventions by demonstrating the positive effects of targeted interventions onbody mass index, flexibility, and self-esteem. The findings highlight the importance of incorporating such interventions into health promotion programs to enhance individuals' physical and psychological well-being.

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