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Pranayama intervention on bone integrity of university level boys

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Abstract

Background and Study Aim: The present study investigated the effects of 12-weeks pranayama intervention on bone integrity of university level boys.

Material and Methods: We utilized a quasi-experimental design with sixty healthy volunteer boys (Mean \pm SD: age, 23.78 \pm 1.14 years; body height, 169.52 \pm 5.44 cm; body weight, 68.59 \pm 10.03 kg) from Guru Nanak Dev University, Amritsar, Punjab, India. The subjects were divided into two groups: Group-A: Pranayama Intervention (PI); (n₁=30) and Group-B: Control; (n₂=30). The sample size (N=60) was calculated using the G*Power 3.1.9.7 software. A power of 0.80 (1- β err prob) and significance level (α) of 0.05. Subjects from both groups (pranayama and control) were assessed at baseline and right after 12-weeks. Group-A: (n₁=30) subjected to PI and Group-B: (n₂=30) with no training.

Results: As compared Pranayama Intervention (PI) with the control one, the 12-weeks Pranayama intervention program had no effect on the PI group with respect to the parameter bone integrity.

Conclusion: Our findings suggest that, while Pranayama training may offer benefits for overall well-being, it may not be as effective as Yogasana, weight-bearing, and resistance exercises in improving bone health. The results indicate that a 12-week Pranayama training regimen did not yield significant improvements in bone health markers, including BMD and bone turnover markers.

Keywords: Bone mineral density, pranayama, anulomvilom pranayama, bhastrika pranayama, kapalbhathi pranayama, bhramari pranayama, sheetkari pranayama, sheetali pranayama

Introduction

Mind and body practices are a group of techniques that are administered or taught by a trained practitioner and Yoga is a practice that fall under this domain. Yoga is a 3000-year-old spiritual and ascetic discipline ^[1]. Yoga, a mind-body intervention, originated in India. Yoga is helpful for chronic pain and low back problems in older women population ^[2]. Yoga is defined as the application of Yoga postures and practice to the treatment of health conditions to prevent, reduce, or alleviate structural, physiological, emotional and spiritual pain, suffering, or limitations ^[3]. Pranayama is a Sanskrit word formed by the conjunction of two words, namely “prana,” meaning breath of life/vital energy, and “ayama,” meaning expansion/regulation/control ^[4]. It is the yogic art of breathing, consisting of the deliberate modifications of the breathing process, such as rapid diaphragmatic breathing, slow/deep breathing, alternate nostril breathing, and breath holding/retention, which are usually done in a seated posture ^[5]. Pranayama practices four important aspects of breathing such as Puraka (inhalation), Recaka (exhalation), Antah Kumbhaka (internal breath retention), and Bahih Kumbhaka (external breath retention) ^[6]. According to the Yoga-Sutra of Patanjali, which is the most authoritative book on Yoga in India, pranayama is the fourth limb of the eight-fold holistic process defined as Yoga ^[7, 8]. Pranayama alone has demonstrated numerous beneficial health effects, including stress relief, beneficial cardiovascular effect, improved respiratory function and enhanced cognition ^[9]. However, at present, there are no systematic reviews evaluating the beneficial health effects of pranayama alone as a practice. Therefore, the present study aims to perform a systematic review of the studies done about the beneficial health effects of pranayama ^[10].

Material and Methods

Participants: We utilized a quasi-experimental design with sixty healthy volunteer boys (Mean \pm SD: age, 23.78 \pm 1.14years; body height, 169.52 \pm 5.44 cm; body weight, 68.59 \pm 10.03

kg) from Guru Nanak Dev University, Amritsar, Punjab, India. The subjects were divided into two groups: Group-A: Pranayama Intervention; ($n_1=30$), and Group-B: Control; ($n_2=30$). The sample size ($N=60$) was calculated using the G*Power 3.1.9.7 software. A power of 0.80 ($1-\beta$ err prob) and significance level (α) of 0.05. Subjects from both groups (pranayama and control) were assessed at baseline and right after 12-weeks. Group-A: ($n_1=30$) subjected to Pranayama Intervention and Group-B: ($n_2=30$) with no training.

Procedure

The DEXA test was used to measure bone mineral density, and the T-Score of DEXA was calculated. Subjects from both groups (pranayama intervention and control) were assessed at baseline and immediately after 12 weeks.

Pranayama Intervention

The training (pranayama intervention) group practiced Anulomvilom, Bhastrika, Kapalbhathi, Bhramari, Sheetkari and Sheetali Pranayama for 12-weeks.

Table 1: 12-week Pranayama Training for subjects

12-week Pranayama Training			
Week	Schedule	Execution Time	Volume
1-4 Week	Preliminary Yogic Exercises 5-minute 20 minute	5 minutes	35 minutes
	Practice of Anulom Vilom Pranayama Bhastrika Pranayama Kapal Bhati Pranayama Bhramari Pranayama Sheetkari Pranayama Sheetali Pranayama (9X1 Set)	25 minutes	
	Om chanting & breathing for relaxation	5 minutes	
5-8 Week	Preliminary Yogic Exercises 5-minute 20 minute	5 minutes	45 minutes
	Practice of Anulom Vilom Pranayama Bhastrika Pranayama Kapal Bhati Pranayama Bhramari Pranayama Sheetkari Pranayama Sheetali Pranayama (12X1 Set)	35 minutes	
	Om chanting & breathing for relaxation	5 minutes	
9-12 Week	Preliminary Yogic Exercises 5-minute 20 minute	5 minutes	55 minutes
	Practice of Anulom Vilom Pranayama Bhastrika Pranayama Kapal Bhati Pranayama Bhramari Pranayama Sheetkari Pranayama Sheetali Pranayama (15X1 Set)	45 minutes	
	Om chanting & breathing for relaxation	5 minutes	

Statistical Analysis

This study’s data analysis procedure was divided into three sections: - The G*Power 3.1.9.7 software was used in the first section. The normality of data was checked by using the Shapiro-Wilk test of normality in the second section.

The hypothesis testing with analysis of paired sample t-test was included in the third section. The level of significance was set at 0.05. The statistical techniques were used to analyze the data on Statistical Package for Social Science (SPSS) version 26.0.

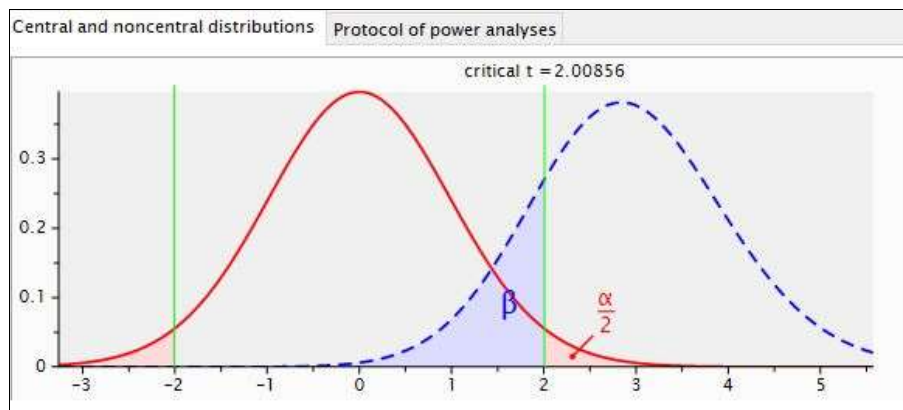


Fig 1: Protocol of power analysis was done to get the required minimum number of sample ($n=52$) for the experimental study with large effect size (0.80), as to obtain the strong impact on power ($1-\beta$ err prob=0.80) of the study at α err prob=0.05

Table 2: Normal distribution of data by utilizing Shapiro-Wilk Test of Normality of Pranayama Intervention (PI).and control one of Bone Integrity (BI) of university level boys

Shapiro-Wilk Test of Normality				
Bone Integrity (BI)				
Sig.	Pranayama Intervention (PI) Group Pre-Test	Pranayama Intervention (PI) Group Post-Test	Control Group Pre-Test	Control Group Post-Test
	0.070	0.084	0.082	0.103

Results

Table 3: Calculated statistical values of Paired sample t-test of Pranayama Intervention and Control one of Bone Integrity (BI) of university level boys

Group	N	Mean	Standard Deviation	Standard Error of the Mean	t-value	p-value
Pranayama Intervention (Before)	30	1.06	0.01	0.00	1.00	0.32
Pranayama Intervention (After)	30	1.06	0.01	0.00		
Control One (Before)	30	1.05	0.01	0.00	1.00	0.32
Control One (After)	30	1.05	0.01	0.00		

The mean and standard deviation values of Bone Integrity (BI) of Pranayama Intervention stood at 1.06±0.01 and 1.06±0.01 congruently. The mean and standard deviation of Bone Integrity (BI) of Control one was 1.05±0.01 and 1.05±0.01 congruently. The variance of Post Bone Integrity (BI) of Pranayama Intervention is insignificant while, the variance of Control one came out as insignificant as well.

Conclusion

Our findings suggest that while Pranayama training may offer benefits for overall well-being, it may not be as effective as Yogasana, weight-bearing and resistance exercises in improving bone health. The results indicate that a 12-weeks pranayama training regimen did not yield significant improvements in bone health markers including BMD and bone turnover markers.

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