



P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (RJIIF): 5.38
IJPESH 2024; 11(4): 257-259
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www.kheljournal.com
Received: 11-04-2024
Accepted: 17-05-2024

Dr. Baljinder Singh Bal
Associate Professor, Department
of Physical Education, Guru
Nanak Dev University,
Amritsar, Punjab, India

Dr. Parmjit Kaur
Assistant Professor, Department
of Physical Education,
Government College,
Hoshiarpur, Punjab, India

Corresponding Author:
Dr. Baljinder Singh Bal
Associate Professor, Department
of Physical Education, Guru
Nanak Dev University,
Amritsar, Punjab, India

International Journal of Physical Education, Sports and Health

Pranayama program on high-density lipoprotein cholesterol levels

Dr. Baljinder Singh Bal and Dr. Parmjit Kaur

Abstract

Background and Study Aim: The present study aims to investigate the effects of a 12-week pranayama intervention on the high-density lipoprotein cholesterol (HDL Cholesterol) levels of female university students.

Material and Methods: In this study, a quasi-experimental design was utilized involving sixty healthy volunteer female students from Guru Nanak Dev University, Amritsar, Punjab, India. The participants' demographic characteristics (Mean \pm SD) included age 24.00 ± 1.79 years, body height 159.12 ± 5.43 cm, and body weight 52.97 ± 7.62 kg. They were divided into two groups: Group-A ($n_1=30$) received the Pranayama Intervention (PI), while Group-B ($n_2=30$) served as the control. The sample size ($N=60$) was determined using G*Power 3.1.9.7 software, with a power of 0.80 ($1-\beta$ err prob) and a significance level (α) of 0.05. Baseline and post-12-week assessments were conducted for both groups, with Group-A undergoing the pranayama intervention and Group-B serving as the untreated control group.

Results: When comparing the Pranayama Intervention (PI) group with the control group, the 12-week Pranayama intervention program did not result in a significant impact on high-density lipoprotein cholesterol (HDLC) levels within the PI group. However, the training exhibited a positive effect of 3.8% on the high-density lipoprotein cholesterol (HDLC) levels of the Pranayama intervention group.

Conclusion: The study concludes that there is no significant difference between the Pranayama Intervention (PI) and control groups of university-level females when controlling for the covariate. Additionally, the 12-week pranayama training resulted in a positive impact of 3.8% on the Pranayama Intervention (PI) group regarding high-density lipoprotein cholesterol (HDL Cholesterol) levels.

Keywords: Pranayama, anulomvilom pranayama, bhastrika pranayama, kapalbhati pranayama, bhrumari pranayama, sheetkari pranayama, sheetali pranayama, high-density lipoprotein cholesterol

Introduction

Yoga is an ancient science, which originated in India and many studies have found that yoga and pranayama can be practiced to combat stress. Pranayama involves manipulation of the breath that is a dynamic bridge between the body and mind ^[1]. Pranayama consists of three phases: "Puraka" (inhalation); "kumbhaka" (retention) and "rechaka" (exhalation) that can be either fast or slow ^[2]. Pranayama has been assigned very important role in Ashtanga Yoga of Maharishi Patanjali and is said to be much more important than yogasanas for keeping sound health ^[3]. Previous studies have shown that both fast and slow pranayamas are beneficial, but they produce different physiological cardiovascular responses in healthy subjects ^[4, 5]. Slow pranayama like Nadi Shuddhi, Savitri and Pranav have been shown to decrease Heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and increase pulse pressure (PP) ^[6]. Few studies indicate that fast pranayamas like Kapalbhati and Bhastrika when practiced alone increases sympathetic activity ^[7]. Modern science has just started to confirm and analyze this fact in more detail. Yogic breathing exercises are known as Pranayamas and are considered a form of meditation in itself, as well as a preparation for deep meditation. They promote physical well-being and self-awareness, improve lung and cognitive capacities, reduce blood pressure, anxiety, and other psychosomatic patterns, probably by increasing the parasympathetic tone ^[8, 9, 10].

Material and Methods

Participants: We used a quasi-experimental design with sixty healthy university-level

volunteer female students (Mean \pm SD; age, 24.00 ± 1.79 years, body height 159.12 ± 5.43 cm, and body weight 52.97 ± 7.62 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- 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: ($n_1=30$) subjected to Pranayama Intervention and Group-B: ($n_2=30$) with no training.

Procedure

The procedure involved collecting fasting blood samples from volunteer participants before and after completing the Pranayama training. The data of blood samples were statistically analyzed for HDL cholesterol levels to assess the impact of 12-week Pranayama intervention on high-density lipoprotein cholesterol (HDL Cholesterol) levels.

Pranayama Intervention

The training (pranayama intervention) group practiced Anulom-Vilom, Bhastrika, Kapalbhathi, Bharamari, 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	
	Preliminary Yogic Exercises 5-minute 20 minute	5 minutes	
5-8 Week	Practice of Anulom Vilom Pranayama Bhastrika Pranayama Kapal Bhati Pranayama Bhramari Pranayama Sheetkari Pranayama Sheetali Pranayama (12X1 Set)	35 minutes	45 minutes
	Om chanting & breathing for relaxation	5 minutes	
	Preliminary Yogic Exercises 5-minute 20 minute	5 minutes	
	Practice of Anulom Vilom Pranayama Bhastrika Pranayama Kapal Bhati Pranayama Bhramari Pranayama Sheetkari Pranayama Sheetali Pranayama (15X1 Set)	45 minutes	
9-12 Week	Om chanting & breathing for relaxation	5 minutes	55 minutes
	Preliminary Yogic Exercises 5-minute 20 minute	5 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 covariance (ANCOVA) 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.

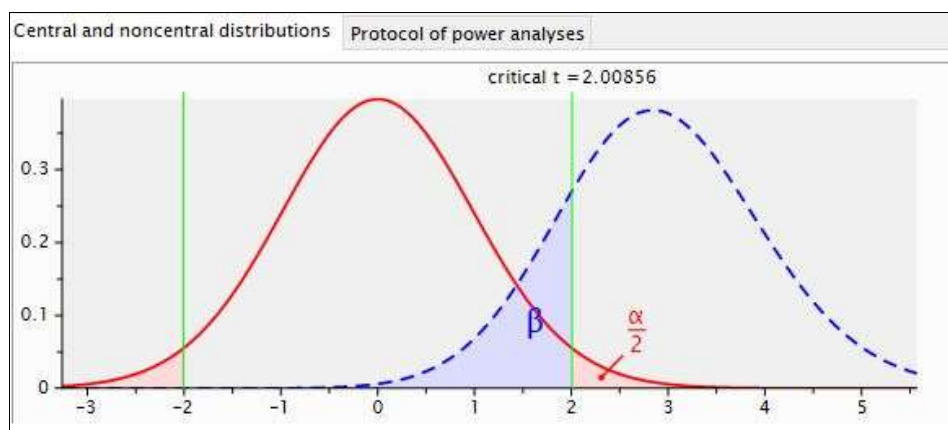


Fig 1: Protocol of power analysis was done to get the required minimum number of sample ($n=52$) for the experimental study with large effect size (0.80), as to obtain the strong impact on power (1- β err prob=0.80) of the study at α err prob=0.05

Table 2: Normal distribution of data by utilizing Shapiro-Wilk Test of Normality of Pranayama Intervention (PI).and control one of High-Density Lipoprotein Cholesterol (HDL Cholesterol) levels of university-level female students

Shapiro-Wilk Test of Normality				
High-Density Lipoprotein Cholesterol (HDL Cholesterol)				
Sig.	Pranayama Intervention (PI) Group Pre-Test	Pranayama Intervention (PI) Group Post-Test	Control Group Pre-Test	Control Group Post-Test
	0.378	0.516	0.206	0.363

Results

Table 3: Analysis of Covariance (ANCOVA) of Pranayama Intervention (PI) and Control Group of High-Density Lipoprotein Cholesterol (HDL Cholesterol) levels of university-level female students

Analysis of Covariance (ANCOVA)						
Source	Type III Sum of Squares	DF	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	34.279 ^a	2	17.139	1.791	.176	.059
Intercept	231.289	1	231.289	24.173	.000	.298
Pre	13.862	1	13.862	1.449	.234	.025
Group	21.554	1	21.554	2.253	.139	.038
Error	545.371	57	9.568			
Total	123977.000	60				
Corrected Total	579.650	59				

a. R Squared = .059 (Adjusted R Squared = .026)

It shows the insignificant value in Group row. In this analysis, pre-test is assumed to be covariate. The P-value .139 is greater than ($p>0.05$) i.e. it is concluded that there is an insignificant difference between the Pranayama Intervention (PI) and control group of university level females by controlling the covariate. Moreover, the Partial Eta Squared value showed that 12-weeks of pranayama training have positive impact of 3.8% on the Pranayama Intervention (PI) group with respect to the variable High-Density Lipoprotein Cholesterol (HDL Cholesterol) levels.

Conclusion

The study concludes that there is no significant difference between the Pranayama Intervention (PI) and control groups of university-level females when controlling for the covariate. Additionally, the 12-week pranayama training resulted in a positive impact of 3.8% on the Pranayama Intervention (PI) group regarding High-Density Lipoprotein Cholesterol (HDL Cholesterol) levels.

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