

RESEARCH ARTICLE

Effect of Pranayama Exercise on Breath-Holding Capacity of Soccer Players

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Abstract

Objective: The purpose of the present study was to investigate the effect of Pranayama exercises on breath-holding capacity soccer players. **Method:** A total of thirty male soccer players (age 18 – 25 year) were selected from Manipur University, Canchipur, Imphal, Manipur (India) who participated in the national level competition. The subjects were randomly assigned into two equal groups, experimental group (n=15) and control group (n=15). The groups were measured before the intervention with the breath holding capacity. Breath holding capacity was assessed by Nostril clip method. The Pranayama exercises were carried out for the period of six weeks, five days training (Monday to Friday) and 60 minutes each session to the training group where no special exercise was administered to the control group. The pre and post-test scores were statistically examined by the Analysis of pair 't' test and Co-Variance(ANCOVA) for selected variables. **Results:** The experimental group showed improved scores in the breath holding capacity compared to the control group (p<0.05). The mean and standard deviation of the breath holding capacity for pre-test and post-test of the experimental group were 33.22±10.22 and 46.46±9.49 respectively. The mean and standard deviation of the breath holding capacity for pre-test and post-test of the control group were 33.17±11.64 and 33.09±11.33 respectively. **Conclusion:** It was concluded that the pranayama training group had shown significantly improved breath-holding capacity and the control group had insignificant improvement. It was confirmed that a six weeks Pranayama training program was effective to improve the breath-holding capacity of soccer players.

Keywords

Yoga, Pranayana, Pranayama exercise, soccer players, Training, physical adaptation

INTRODUCTION

Soccer is the world's most popular team game. Modern soccer is very fast by its nature, the spectators and the players enjoy the game. Nowadays with the demand for "high sports performance" the concept of soccer has been changed. The concept of soccer has applied skill, technical, tactical development, development of all-important motor components and physiological parameters which are closely associated and

contributes to performance in soccer . Not only technical, physiological development, the sports scientists are also making efforts to develop the intellectual ability of the soccer players. As in the literature, it has been shown that endurance, speed, agility, maximum leg strength, upper body strength, leg power, muscular endurance, flexibility, coordination and reaction time are important prerequisites for efficient soccerperformance (Singh et al., 2018; Singh et al., 2016).

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Soccer is a complex game of physical and mental challenges. It must execute skilled movements under generalized conditions of restricted space, limited time, physical and mental fatigue and opposite players (Luxbacher, 2013). The skills involved in the game are simple, natural and yet are highly stimulating and satisfying to anyone who participates in the game (Thomas, 1964). It is a game requiring a high level of fitness. It is one of those rare games which demands not only speed but agility, strength, power, and endurance along with skill. Training is essentially a preparation of the individual athlete so that he can withstand competition stress when he encounters and perform to maximum effectiveness. Soccer training process is partly designed to improve the capacities of individual players to ensure a capability to cope with the loads that competitive match play involves. A high level of match play, which involves kicking, short sprinting, throwing, catching, trapping etc. The activities of the game include short sprinting as well as casual recovery movements. As the players have to cover a big area in the ground during attack and defense therefore, the game demands for aerobic as well as anaerobic fitness (Reilly, 1996; Reilly et al., 2000, Singh et al., 2018).

The preparation of a sportsman represents a multifaceted process of purposeful activity. Yoga breathing (pranayama) is a renowned early exercise for breathing regulation, frequently executed in combination with meditation or yoga, for its spiritual and distinguished health improving effects. Many types of pranayama are present, for example nostril breathing (double, single or alternate), abdominal breathing, strong and forceful breathing and vocalised (chanting) breathing, which are carried out at altering rates and depths (Jerath, 2006). Yoga is called a skilful trick to calm down the mind. According to Swami Vivekananda, it is a conscious process to accelerate the evolution into a single life, a few years or just a few days by controlling the behavior internally as well as externally, this state can be achieved by following work or Karma Yoga, by worship or Bhakti Yoga, by knowledge or Jnana Yoga and by psychic control or Raja Yoga (Murthy, 2010).

Yoga is a physical and mental discipline that originated in Indian culture over 2000 years ago. The physical practice of postures (Asanas) was originally intended to prepare the body for

meditation. In general, yogic practices are considered and commonly practice the Asanas as the development of health and fitness (Ganguly et al. 1989). It is a traditional science, and is becoming very popular all over the world day by day due to its scientific research. Yoga exercises with their varied types help to stabilize and balance the internal system of the body, thereby bringing about general physical fitness and physiological homeostasis. Yoga is mostly aerobic and anaerobic types of activities which have more impact on various physiological systems in the human body (Singh et al., 2016). Yoga is the ancient science of India, it is a conscious process for gaining mastery over the mind and body and thereby growing faster from the animal level to become normal human beings and reach the height of greatness (Singh et al., 2017).

The ancient Indian science of Yoga makes use of voluntary regulation of the breathing to make respiration rhythmic, and to calm the mind. This practice is called Pranayama. Pranayama is a Sanskrit word meaning "restraint of the prana or breath". The word is composed of two Sanskrit words, Prana, life force, or vital energy, particularly, the breath, and "ayama", to suspend or restrain. It is often translated as control of the life force (prana). Pranayama means control of breath and it involves three main phases which is much more important to keep strength of respiratory system and thus a whole of human body. These are best practiced in the early hours of the morning or after sunset (Kanniyan, 2014).

Breathing is a vital process that starts at the time of birth and stops when a person dies. During breathing, the life sustaining oxygen is provided to all the parts, organs and cells of the body. One can control the rhythm of panic energy with pranayama and attain a healthy body and mind. The ancient yogic developed many breathing techniques to maximize the benefits of Pranayama. It is also used in preparation and meditation of postures, to help maximize the benefit of the practice focus and mind (Xavier, 2006). Of course, yoga science of breathing is called pranayama. It is a systematic exercise of respiration, which makes the lungs stronger, improves blood circulation, makes the man healthier and bestows upon him the boon of a long life. It aids the respiratory system function at its best whereby the life force can be activated and regulated in order to go beyond one's normal boundaries or limitations and attain a

higher state of vibratory energy (Iyengar,1981). breathe only through the nose. Breathing through the nose is great start to improve health. It is also important that breathing volume is normal and regular. The normal exhalation, approximately for 40 seconds, the urge to breathe increases enough to initiate inspiration. Nasal breathing during physical exercise allows for a work intensity great enough to produce an aerobic training effect (Chaudhary et al., 2021). The Pranayama practice makes use of the diaphragm fully by drawing into the lowest and largest part of the lungs. Due to the regular practice of the Pranayama, with each inhale to bring oxygen into the body and each exhale purges the body of carbon dioxide, a toxic waste. Breathing also affects the state of mind (Cooper et al., 2003; Danucalov, 2008).

Statement of the Problem

The researcher was interested in the study to determine the effect of Pranayama exercise of Soccer players. So, from the above literature the researcher decided to statement of the problem as entitled “Effect of Pranayama Exercise on Breath Holding Capacity of Soccer Players”

Objective of the Study

The main objective of the study was to investigate the effect of pranayama exercise on breath holding capacity of soccer players.

Table 1: Sample properties, statistics features and demographic values

Tests	M±SD		Median		Skewness coefficient	
	EG (n=15)	CG (n=15)	EG (n=15)	CG (n=15)	EG (n=15)	CG (n=15)
Age (years)	21.20±1.31	20.74±1.49	20.00	20.00	0.08	0.00
Height(m)	1.57±0.07	1.56±0.05	1.56	1.58	0.89	1.15
Weight (kg)	53.70±4.13	53.30±2.86	52.50	54.50	0.78	0.58
BMI (kg/m²)	21.07±1.50	22.01±1.40	21.50	21.65	1.11	0.43
Experience (years)	2.08±0.96	2.01±0.69	2.50	1.50	0.11	0.78

Values of the experimental group (EG) and control group (CG) are presented as mean (M), standard deviation (SD), median, body mass index (BMI) and skewness coefficient.

The graphical representation of sample demographic values of the experimental group and control group was shown at figure 1.

The foundation of Buteyko breathing method is to

METHODOLOGY

Selection of Subjects

For this study, thirty male soccer players were selected from Manipur University, Canchipur Imphal, Manipur (India) who participated in national level competition. The age of subjects ranged between 18-25 years. To determine the sample demographic of experimental group (n=15) and control group (n=15), the researcher extracted skewness coefficient for age, height, weight, body mass index (BMI) and experience, after extracting mean, standard deviation, median and skewness for each items.

The participants of this study are humans. The study was approved by the Institutional Human Ethical Committee of Manipur University, Canchipur, Imphal (India) with Ref. No.MU/IHEC/2021/022 and informed consent was obtained from the participants. Participants who volunteered for the study were informed with a written informed consent form.

The results showed a sample demographic because it was between ± 5 as shown in table 1.

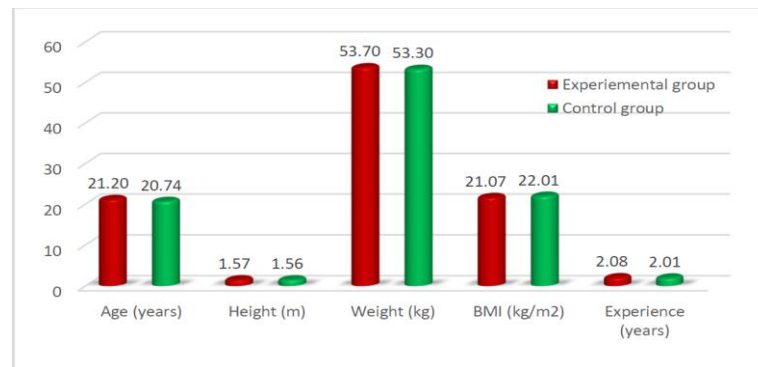


Figure 1: The graphical representation of demographic values of the experimental group and control group

Selection of the Test

To measure the breath holding capacity by using the breath holding capacity (Manual Nostril Clip Method) was selected as a test administered.

Criterion Measures

The Criterion measures for the administration of tests for breath holding capacity of the subjects the breath holding capacity (Manual Nostril Clip Method) was used and measure of recorded in seconds.

Design of the Study

The selected thirty male soccer players subjects were randomly assigned into two equal groups, as Experimental group (n=15) and control group (n=15). The specific selected test item was breath-holding test. The groups were measured in the breath-holding test before intervention of the Pranayama exercise training program. After the initial test, the subjects of the experimental group participated in a supervised Pranayama exercise training program, control group was given only soccer practice, where no special exercise was administered. The Pranayama exercise training

program was carried out for the period of six weeks, five days training (Monday to Friday) and 60 minutes each session. And this research will proceed from 25th January to 25th March 2022.

Training Program

The objects from this study have been training followed by the Pranayama exercise training program. These training program by following the recommended exercise allowance which was suggested in Thompson et al. (2013), we have processed total 60 minutes work out with warm-up exercise for 10 min, main exercise for 40 min, warm-down exercise for 10 min. The exercise was applied for 6 weeks with 5 times a week. With increasing the scale and number of exercise movements which increases the intensity of exercise (Santosh, 2018), we have composed a routine that does not get out of the previously set maximum exercise intensity. And also when practicing each move, we have focused on safety more than accuracy so we suggested a bit changed movement in parts which was tough to follow. The specific contents are composed as table 2.

Table 2: Six weeks pranayama exercise training program for exercise group

Weeks	Pranayama exercise	Repetition	Set	Volume of Contact	Total no. of Contact
1 -2 Weeks	Anulom vilom (Alternate Nostril Breathing)	10	2	20	200
	Bhastrika (Bellow's Breath)				
	Ujjayi (Victorious Breath)				
	Bhramari (Humming Bee Breath)				
	Kapalbhati (Skull-Shining Breath)				
3 -4 Weeks	Anulom vilom (Alternate Nostril Breathing)	10	3	30	300
	Bhastrika (Bellow's Breath)				
	Ujjayi (Victorious Breath)				
	Bhramari (Humming Bee Breath)				
	Kapalbhati (Skull-Shining Breath)				
5 -6 Weeks	Anulom vilom (Alternate Nostril Breathing)	10	4	40	400
	Bhastrika (Bellow's Breath)				
	Ujjayi (Victorious Breath)				
	Bhramari (Humming Bee Breath)				
	Kapalbhati (Skull-Shining Breath)				

Statistical Analysis

The collected data were entered into an excel sheet and statistical analyses were conducted using the IBM SPSS software (version 22.0; SPSS Inc., Chicago, IL, USA). Normality of statistical distribution was tested by using descriptive statistics, paired t-test and ANCOVA was applied to examine differences among groups. The level of significance used in the statistical analyses was 0.05.

RESULTS

The result of the study showed that there was significant improvement of breath holding capacity of selected subjects of the experimental group. The descriptive analysis of pre-test and post-test of the experimental group was presented at table 3.

Table 3: Pre-test and post-test means of breath holding capacity for experimental group

Variable	Group	Mean	N	Std. Deviation	MD	SE	df	t-value
Breath holding capacity	Pre-test	33.22	15	10.22	14.25	1.77	14	8.05*
	Post-test	46.46	15	9.49				

*Significant at level of confidence 't' 0.05 (14) = 2.145

Table 3 reveals that the mean and standard deviation of the breath holding capacity for pre-test and post-test of the experimental group were 33.22±10.22 and 46.46±9.49 respectively. In addition, the mean difference and standard error of

The graphical representation of pre-test and post-test mean comparisons for breath holding

pre-test and post-test was also found as 14.25 and 1.77 respectively. There was a significance difference as the value obtained was 8.05*, whereas the tabulated value was 2.145 at 0.05 level of significance.

capacity of the experimental group was shown at figure 2.

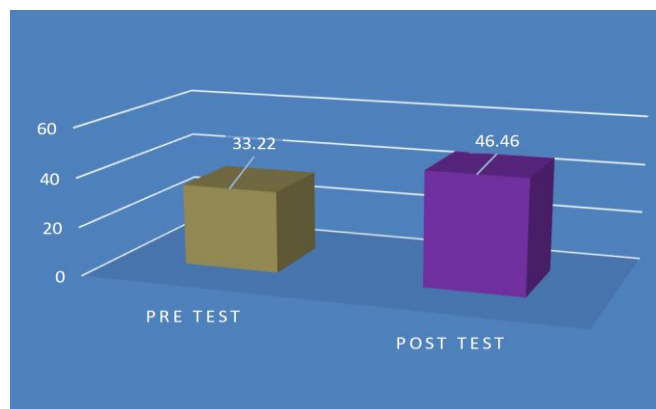


Figure 2: Pre-test and post-test means comparison of breath holding capacity for experimental group

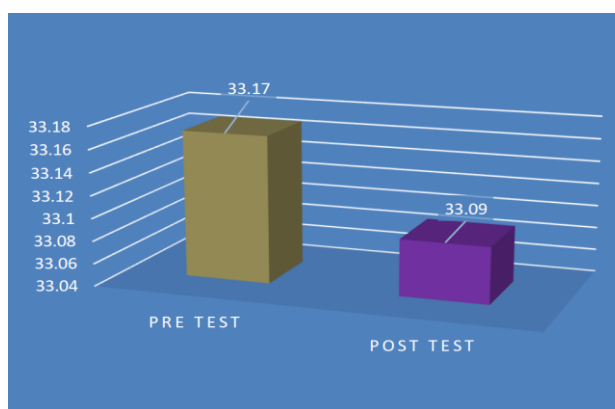


Figure 3: Pre-test and post-test means comparison of breath holding capacity for control group

The descriptive analysis of pre-test and post-test of control group for breath holding capacity was presented at table 4.

Table 4: Pre-test and post-test means of breath holding capacity for control group

Variable	Group	Mean	N	Std. Deviation	MD	SE	df	t-value
Breath holding capacity	Pre-test	33.17	15	11.64	0.087	0.23	14	0.38
	Post-test	33.09	15	11.33				

Significant at level of confidence 't' 0.05 (14) = 2.145

Table 4 reveals that the mean and standard deviation of the breath holding capacity for pre-test and post-test of the control group were 33.17±11.64 and 33.09±11.33 respectively. In

addition, the mean difference and standard error of pre-test and post-test was also found as 0.087 and 0.23 respectively. There was an insignificant difference as the value obtained was 0.38, whereas

the tabulated value was 2.145 at 0.05 level of significance. The graphical representation of pre-test and post-test mean comparisons for breath holding capacity of the control group was shown at figure 3.

Table 5: Pre-test and post-test means comparison between experimental and control groups For breath holding capacity test

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Group	1508.88	1	1508.8		
Error	600.69	27	22.25	67.838*	.000
Total	51866.60	30			

*Significant at 0.05 level of confidence $F(1, 27) = 4.21$ ($N=30$)

Table 5 reveals that there was found significant difference between pre-test and post-test means comparison score of the experimental group and control group for breath holding capacity test by analysis of co-variance (ANCOVA) as the obtained critical value of $F=67.838^*$ was less than the tabulated value of $F=4.21$, therefore, it was confirmed that six weeks Pranayama exercise training program was effective to improve the breath holding capacity of soccer players.

DISCUSSION

Soccer is the world's most popular game and requiring a high level of fitness. Pranayama exercise training program and the fact that this group received proper breathing techniques to improve breath holding capacity and resulted in the development of more functional and relevant motor programs that control the complex intramuscular coordination. The purpose of the present study was to investigate the effect of Pranayama exercises on breath holding capacity soccer players by giving the Pranayama exercise training program that was carried out for the period of six weeks, five days training (Monday to Friday) and 60 minutes each session. The findings of the study also revealed that there were significant effects of Pranayama exercise training program on breath holding capacity, which were proved by the application of appropriate statistical techniques as the descriptive analysis, paired t-test and ANCOVA was employed.

On the basis of the finding, an experimental group of soccer players has shown the significant effect on Pranayama exercise training program compared with the control group of soccer players

The analysis of co-variance (ANCOVA) of pre-test and post-test between experimental group and control group for breath holding capacity was presented at table 5.

of Manipur University. In the finding, the mean and standard deviation of the breath holding capacity for pre-test and post-test of the experimental group were 33.22 ± 10.22 and 46.46 ± 9.49 . And the control group were 33.17 ± 11.64 and 33.09 ± 11.33 respectively. The significant improvement on breath holding capacity of soccer players of the experimental group might be due to the nature of exercises for six weeks and a quick physical adaptation of the soccer players. The result of breath holding capacity revealed significant improvement among the swimmers as a result of pranayama exercise training ($F= 67.838$, $p < 0.00$). Thus, daily pranayama exercise training was found better in improving breath holding capacity which is an essential factor to improve soccer performance.

The results of this study indicate that pranayama training is effective in improving breath holding capacity of soccer players. Soccer players are considered as one of the best exercises and its competition is organized from school to university level as well as from subdivision to international level. Depending on the popularity and importance of swimming events, many strategies and advanced techniques have been developed by the scientists from the field of physical education and sports. Previous research indicates that yogic breathing exercise of six weeks has shown significant improvement in breath hold capacity of women soccer players (Subramani et al., 2016). Especially, during competition, a soccer player needs a good start to win and, for this, he/she must possess a study of respiratory rate to the official's signal to control the body and mind. Although there are many factors involved behind a soccer player's winning, breath holding capacity during the competition is also an

important issue. The present investigation, therefore, considered an important variable, namely, breath holding capacity for elite soccer players. While in search of a new strategy to enhance breath holding capacity, the literature of yoga during the recent past revealed that yoga indicates significant improvement in cardiorespiratory function (Bera et al., 1993; Bera et al., 1990). It was realised, these studies indicate that along with other components of yoga almost all the training interventions are composed of different types of pranayama. Therefore, pranayama training may be of immense use in improving fitness abilities of the soccer players. Similar study found a significant improvement in all pulmonary function with a significant decrease in RR could be mainly due to regulated, slow, deep and controlled breathing for prolonged period during pranayama practice leading to increase in the strength and endurance of expiratory as well as inspiratory muscles and contributing to enhanced voluntary control of breathing. As a technique, pranayama can assume rather complex forms of breathing, but the essence of the practice is slow and deep breathing. Such breathing is economical because it reduces dead space ventilation. It also refreshes air throughout the lungs, in contrast with shallow breathing that refreshes air only at the base of the lungs (Rajesh et al., 2004). Some similar research has confirmed that the pranayama practices training group had shown significantly improved breath holding time (Sugumar C. et al., 2010). The similar type of results of the study showed that the VO₂ max was significantly improve due to the combined practice of asana pranayama and SAQ training (Muktamath et al., 2013). Some study indicates that there is a huge impact of yogic practices on Physical variables. Experimental group resembles high elevation rather than control group. Football Players who have undergone yogic practices like Asana, Pranayama's and Meditation before their usual soccer training regime show better performance than players who have not undergone the yogic practices (Sathiyamoorthy et al., 2019; Acharya et al., 2010). On the other hand, pranayama practices group improved the selected dependent variables such as speed and agility better than skill training soccer players of Manipur University for their positive contribution, help, and cooperation.

without pranayama practice and control groups (Paramanandam et al., 2019; Kumar et al., 2018; Hollingshead, 2002). The effects of the study indicate that the experimental group namely game yogic training group (asanas and pranayama) had shown significant enhancement in flexibility and vital capacity among the college level football players (Chochalingam et al. 2022; Shukla, 2020; Selvaraja et al., 2018).

On the basis of the results, it was considered that the Pranayama exercise training program has produced significant improvement of breath holding capacity of soccer players in the experimental group than control group. Therefore, the six weeks Pranayama exercise training program had a significant effect on the breath holding capacity of soccer players. In this study were selected from male soccer players were selected as subjects, so further attempts can use female and different age groups of soccer players also and future research should use larger samples to be better generalizability. And, similar studies may also recommend other games and sports in order to enhance the performance of the players.

Conclusion

Pranayama is a traditional yoga practice of controlling breathing technique. The regular practice of Pranayama integrates the mind and the body. It was concluded that the pranayama practices training group had shown significantly positive improvements in breath holding capacity. However, the control group had not shown any significant improvement on any of the selected variables such as breath holding capacity. The similar studies were concluded that the pranayama practices training group had shown significantly improved in breath holding time. However, the control group had not shown any significant improvement on any of the selected variable such as breath holding (Vigneshwaran, 2015). It was confirmed that a six weeks Pranayama exercise training program was effective to improve the breath holding capacity of soccer players.

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Conflict of interest

No conflict of interest is declared by the authors. In addition, no financial support was received.

Ethics Statement

The participants of this study are humans. The study was approved by the Institutional Human Ethical Committee of Manipur University, Canchipur, Imphal (India) with Ref. No.MU/IHEC/2021/022 and informed consent was obtained from the participants. Participants who volunteered for the study were informed with a written informed consent form.

Author Contributions

Study Design, LSS, SOS; Data Collection, LSS; Statistical Analysis, LSS, OPD; Data Interpretation, WJS; Manuscript Preparation, WJS, SSS; Literature Search, LSS, SSS. All authors have read and agreed to the published version of the manuscript.

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