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Effect of yogic training and brisk walking on selected physiological variable (mean arterial blood pressure) among diabetic patients

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Abstract
The purpose of the study was to find out the relative effect of yogic training and brisk walking on selected physiological variables (Mean Arterial Blood Pressure) among diabetic patients. Randomly selected (N=30) diabetic patients who were undergoing treatment in Government Hospital, Hyderabad were selected as subjects for this study with their consent. The subjects were divided into three groups, experimental group-I, experimental group-II and control group. Experimental group-I underwent yogic practices, experimental group-II underwent brisk walking and control group was not given any special treatment. Pre--tests were conducted for all the subjects on selected physiological variables such as, mean arterial blood pressure. The experimental groups participated in their respective exercises, namely brisk walking for twelve weeks and yogic exercises for twelve weeks. The post-tests were conducted on the above said dependent variables after a period twelve weeks. The difference between the initial and final scores was considered the effect of respective experimental treatments. To test the statistical significance ANCOVA was used. In all cases 0.05 level was fixed to test the hypothesis.

Keywords: Yogic Training, Brisk walking Physiological Variable, (Mean Arterial Blood Pressure)

Introduction

Yoga

Yoga means the experience of oneness or unity with inner being. This unity comes after dissolving the duality of mind and matter into supreme reality. It is a science by which the individual approaches truth. The aim of all yoga practice is to achieve truth where the individual soul identifies itself with the supreme soul or God. Yoga has the surest remedies for man's physical as well as psychological ailments. It makes the organs of the body active in their functioning and has good effect on internal functioning of the human body. Yoga is a re-education of one's mental process, along with the physical. The stages of yoga are eight, *Yama, Niyama, Pranayama, Pratyahara, Dharana, Dhyana* and *Samathi*, they are all integrated (Iyangar, B.K.S. 1999).

Walking

Walking, also called ambulation is the main form of animal locomotion on land, distinguished from running and crawling. When carried out in shallow waters, it is usually described as wading and when performed over a steeply rising object or an obstacle it becomes scrambling or climbing. The word walk is descended from the Old English wealcan "to roll".

Brisk walking

Human walking is accomplished with a strategy called the double pendulum. During forward motion, the leg that leaves the ground swings forward from the hip. This sweep is the first pendulum. Then the leg strikes the ground with the heel and rolls through to the toe in a motion described as an inverted pendulum. The motion of the two legs is coordinated so that one foot or the other is always in contact with the ground. The process of walking recovers approximately sixty per cent of the energy used due to pendulum dynamics and ground reaction force.

Physiology

Physiology is the science of functioning of all the organs and systems of an organism. For the physiological system of the body to be fit, they must function well enough to support to specific activity that the individual is performing more over different activity make different demands upon the organism with respect to circulatory, respiratory, metabolic and neurologic process which are specific to the activity.
In physiology, one learn how the organs, systems, tissues, cells and molecules within cells work and how their functions are put together to maintain the internal environment. Physiology is the science dealing with the study of human body functions. Exercise physiology is the study of how body's structures and functions are changed as a result of exercise. It applies the concept of exercise physiology to training the athlete and enhancing the athlete's sports performance (Ajmer Singh, 2005) [1].

Mean Arterial Pressure

Mean arterial blood pressure is defined as the average arterial pressure during a single cardiac cycle. As blood is pumped out of the left ventricle into the arteries, pressure is generated. The mean arterial pressure (MAP) is determined by the cardiac output, systematic vascular resistance and central venous pressure according to the following relationship, which is based upon the relationship between flow, pressure and resistance (Mathews, 1981) [2].

Statement of the problem

The purpose of this study was to determine the relative "Effect of yogic training and brisk walking on selected physiological

variables (Mean Arterial Blood Pressure) among diabetic patients".

Methodology

The purpose of the study was to find out the relative effect of yogic training and brisk walking on selected physiological variables (Mean Arterial Blood Pressure) among diabetic patients. the selection of subjects, selection of variables, pilot study, reliability of the data, Training schedule, administration of tests, research design for the study, laboratory tests taken for the subjects, experimental procedure and the statistical technique used.

Selection of subjects

Thirty male subjects who were undergoing treatment in Government Hospital, Hyderabad for diabetic were randomly selected in the age group of thirty five to forty five years were selected and they were assigned into three different groups. The groups were considered as experimental group-I, experimental group-II and control group consisting of ten diabetic patients in each.

Control Group

Subjects who were in the control group didn't undergo any exercise but followed their routine diabetic treatment and diet pre-scribed by the physicians.

Experimental Group-I

Along with their routine diabetic medication subjects were provided with the brisk continuous walking for 30 minutes without rest. The walking exercise were performed from Monday through Saturday for six days in a week.

Experimental Group-II

Along with their routine diabetic medication subjects were provided with yogic training for 30 minutes. The training were provided from Monday through Saturday for six days in a week. The requirements of the experimental procedures, testing as well as exercise schedules were explained to them so as to avoid any ambiguity of the effort required on their part and prior to the administration of the study, the investigator got the individual consent from each subject.

Selection of variables

The research scholar reviewed the various scientific literatures pertaining to diabetics, exercises for diabetic patients and on the effects of walking and yogic practices on physiological variables from books, journals, periodicals, magazines and research papers. Taking into consideration of feasibility criteria, availability of instruments and the relevance of the variables of the pre-sent study, the following variables were selected.

Dependent Variables: Physiological Variables

Mean Arterial Blood Pressure

Independent Variables

1. Twelve weeks of Brisk Walking Exercises
2. Twelve Weeks Yogic Training

Experimental design

Random group design was followed in this study. Randomly selected (N=30) diabetic patients who were undergoing treatment in Government Hospital, Hyderabad were selected as subjects for this study with their consent. The subjects were divided into three groups, experimental group-I, experimental group-II and control group. Experimental group-I underwent yogic practices, experimental group-II underwent brisk walking and control group was not given any special treatment. Pre--tests were conducted for all the subjects on selected physiological variables such as, mean arterial blood pressure. The experimental groups participated in their respective exercises, namely brisk walking for twelve weeks and yogic exercises for twelve weeks.

The post--tests were conducted on the above said dependent variables after a period twelve weeks. The difference between the initial and final scores was considered the effect of respective experimental treatments. To test the statistical significance ANCOVA was used. In all cases 0.05 level was fixed to test the hypothesis.

Collection of data

The purpose of the study was to estimate the relative effects of yogic training and brisk walking on selected physiological variables among diabetic patients. For this purpose, the research scholar followed the following procedure

The subjects of the study were selected at random and divided into three groups. Among the three groups, the control group was strictly under control, without undergoing any special activity. The experimental groups were undergone with the experimental treatments.

The experimental groups were well acquainted with their allotted techniques and did only the experimental treatment given to them for a period of twelve weeks under the personal supervision of the researcher.

Pre- and post-experimental data on selected physiological variables from all the subjects to find out the effects of yogic training and brisk walking.

Training programme

Yogic Training

In order to give scientific yogic training to the subjects, the investigator selected *asanas* for warm up, *asanas* for practice, *pranayama* for breath holding and cleansing and *savasana* for relaxation.

Each session lasted for 45 minutes consisting of 10 minutes warm up, followed by five *asanas* each lasting for 15 minutes (5 x 3 minutes), 10 minutes *pranayama* and 10 minutes relaxation.

Suryanamaskar was given to the subjects as warm up *asana*, any five of the following *asanas Padmasana, Adhra Chakrasana, Vipareeta Karani Mudra, Ardha Pawanmuktasana, Vajrasana, Trikonasana, Padahastasana, Halasana, Bhujangasana, Salabhasana, Dhanurasana, Paschimottanasana* were given to the subjects as *yogasana* practices. Any two of the three *pranayamas Nadi Sodhana Pranayama, Kapalabhati Pranayama* and *Sheetali Pranayama* were given to the subjects. As a relaxation *asana*, *savasana* was asked to be practiced for 10 minutes.

Table 1: Yogic practices for first four weeks

S. No.	Yogic Practices	Duration
1	*Surya Namaskar*	10 minutes
2	*Padmasana*	3 minutes
3	*Ardha Chakrasana*	3 minutes
4	*Vipareeta Karani Mudra*	3 minutes
5	*Ardha Pawanmuktasana*	3 minutes
6	*Padahastasana*	3 minutes
7	*Kapalbhati Pranayama*	5 minutes
8	*Sheetali Pranayama*	5 minutes
9	*Savasana*	10 minutes

Table 2: Yogic practices for fifth to 8th weeks

S. No.	Yogic Practices	Duration
1	*Surya Namaskar*	10 minutes
2	*Vajrasana*	3 minutes
3	*Trikonasana*	3 minutes
4	*Padahastasana*	3 minutes
5	*Halasana*	3 minutes
6	*Bhujangasana*	3 minutes
7	*Nadi Sodhana Pranayama*	5 minutes
8	*Sheetali Pranayama*	5 minutes
9	*Savasana*	10 minutes

Table 3: Yogic practices for ninth to 12th weeks

S. No.	Yogic Practices	Duration
1	*Surya Namaskar*	10 minutes
2	*Halasana*	3 minutes
3	*Bhujangasana*	3 minutes
4	*Salabhasana*	3 minutes
5	*Dhanurasana*	3 minutes
6	*Paschimotanasana*	3 minutes
7	*Nadi Sodhana Pranayama*	5 minutes
8	*Kapalvati Pranayama*	5 minutes
9	*Savasana*	1- 3 minutes

Training Procedure

The training programmes, namely, yogic practices were given to subjects in circuit training basis for five days a week for a period of twelve weeks in the morning sessions were admitted. Proper warming up and very basic things required for the training were provided to the subjects. The investigator sought the help of two assistants who were well versed with these training programmes for the smooth functioning of the treatment and for controlling the subjects during the course of training.

Brisk Walking Training

Experimental group subjects for brisk walking were required to undergo brisk walk for 30 minutes continuously without any rest. They underwent this training from Monday to Saturday, six weeks per weeks, excluding Sundays, the experimental period was for 12 weeks. Proper warm up and warm down timings were given to the subjects during the experimental period

Mean Arterial Blood Pressure

Blood pressure: The purpose of the test was to measure the systolic and diastolic blood pressure.

Equipment: A dial types of sphygmomanometer and stethoscope a chart and a table was used for recording the blood pressure.

Procedure: The blood pressure for all the subjects was checked in the morning. The subjects were given adequate time to relax in a chair in a comfortable position so that the normal pressure was restored. While taxing the blood pressure the subjects' right arm was completely made bare to make certain that the clothes did not compress the blood vessels. The instrument was kept at the level of the heart on the table. The blood pressure measurement was taken with the subject in sitting positions the forearm being kept straight in relaxed positions on the table. The pressure cuff was wrapped around the arm evenly the lower edge being placed approximately one inch above the antecubital space. Care was taken that the stethoscope was not in contact with the cuff. The cuff was inflated until the artery was fully pressed, so that no heart beat could be learned.

When the heart beat was not audible air was released by opening the air value of the rubber tube and the systolic stroke the heart sent to spurt into artery and at the peak of the systolic stroke. The first heart beat become audible at which instant the read in millimeter of measuring (mmhg) was recorded with the gradual release of air, the heart beat become muffled and then disappeared. This indicated blood pressure at the diastolic stage and the reading was noted in mm Hg.

Like the same blood pressure was recorded after the walking exercise was over.

Mean arterial pressure: Mean arterial pressure also measured by using the formula.

P mean = Diastolic pressure + 1/3 pulse pressure.

Pulse pressure is the difference between systolic pressure and diastolic pressure.

Results on mean arterial blood pressure

The statistical analysis comparing the initial and final means of Mean Arterial Blood Pressure due to Yogic practices and brisk walking among diabetic patients is presented in Table IV

Computation of analysis of covariance of mean arterial blood pressure

	Yogic Practices Group	Brisk Walking Group	Control Group	Source of Variance	Sum of Squares	Df	Mean Squares	Obtained F
Pre-Test Mean	93.30	91.50	92.30	Between	16.27	2	8.13	0.23
				Within	940.70	27	34.84	
Post-Test Mean	84.90	87.10	91.60	Between	233.27	2	116.63	6.99*
				Within	450.20	27	16.67	
Adjusted Post-Test Mean	84.55	87.43	91.63	Between	252.49	2	126.24	10.40*
				Within	315.47	26	12.13	
Mean Difference	-8.40	-4.40	-0.70					

Table F-ratio at 0.05 level of confidence for 2 and 27 (df) =3.35, 2 and 26 (df) =3.37.

*Significant at 0.05 level

As shown in Table IV, the obtained pre-test means on Mean Arterial Blood Pressure on Yogic practices group was 93.30, Brisk walking group was 91.50 was and control group was 92.30. The obtained pre- test F-value was 0.23 and the required table F-value was 3.35, which proved that there was no significant difference among initial scores of the subjects.
The obtained post-test means on Mean Arterial Blood Pressure on Yogic practices group was 84.90, Brisk walking group was 87.10 was and control group was 91.60. The obtained post-test F-value was 6.99 and the required table F-value was 3.35, which proved that there was significant difference among post- test scores of the subjects.
Taking into consideration of the pre-test means and post-test means adjusted post-test means were determined and analysis of covariance was done. The obtained F-value 10.40 was greater than the required value of 3.37 and hence it was accepted that there were significant differences among the treated groups.
Since significant differences were recorded, the results were subjected to post- hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table V.

Scheffe's Confidence Interval Test Scores on Mean Arterial Blood Pressure

MEANS				Required C.I.
Yogic practices Group	Brisk walking Group	Control Group	Mean Difference	
84.55	87.43		2.88	4.03
84.55		91.63	7.08	4.03
	87.43	91.63	4.20	4.03

***** Significant at 0.05 level

The post- hoc analysis of obtained ordered adjusted means proved that there were significant differences existed between Yogic practices group and control group (MD: 7.08). There was significant difference between brisk walking group and control group (MD: 4.20). There was no significant difference between treatment groups, namely, Yogic practices group and brisk walking group. (MD: 2.88).
The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure-I.

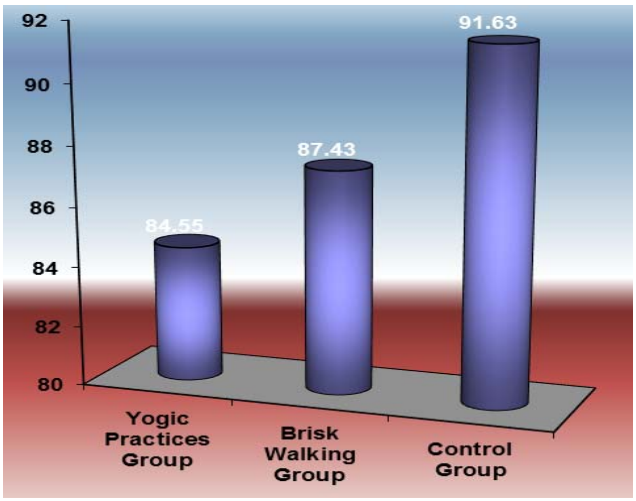

Fig 1: Bar diagram on ordered adjusted means on mean arterial blood pressure

Discussions on findings on mean arterial blood pressure
The effect of Yogic practices and brisk walking on Mean Arterial Blood Pressure is presented in Table IV. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F-value 10.40 was greater than the required table F-value to be significant at 0.05 level.
Since significant F-value was obtained, the results were further subjected to post-hoc analysis and the results presented in Table V proved that there was significant difference between Yogic practices group and control group (MD: 7.08) and Brisk walking group and control group (MD: 4.20). Comparing between the treatments groups, it was found that there was no significant difference between Yogic practices and brisk walking group among diabetic patients.
Thus, it was found that yogic practices and brisk walking were significantly better than control group in beneficially altering Mean Arterial Blood Pressure of the diabetic patients.
The post-hoc analysis of obtained ordered adjusted means proved that there were significant differences existed between control group and experimental treatments, namely, yogic exercises and brisk walking. This proved that due to twelve weeks brisk walking exercises and yogic exercises the diabetic patients have stabilized their mean arterial blood pressure. When comparing between the experimental groups, it was found that there were no significant differences between yogic exercises group and brisk walking group.
The twelve weeks *yogasana* training and brisk walking induced to exert more energy and exercise themselves along with their usual medication. As the subjects began to do the physical exertion there was increased blood circulation, which resulted in stabilization of blood pressure. With the additional aerobic power, the blood pressure began to stabilize. Hence, there was reduction in blood pressure. The findings proved that the twelve weeks of yogic and walking exercises has beneficially altered mean arterial blood pressure significantly.
Yeater (1999) [3] found two months supervised exercise sessions consisted of 40-45 minutes of walking and/or slow jogging resulted in resting systolic blood pressure decreased from 141 to 130 mmHg. After training and resting heart rate decreased in the exercise group in seven or eight subjects and in only two of eight controls. Wallberg-Henrikson (1998) [4] found exercise training also improved many other physiological and metabolic abnormalities that are associated with diabetics including reducing blood pressure. Lohan and Rajesh (2002) found blood pressure, heart rate, breath holding time, vital capacity and pulse rate was improved by the training of selected yogic exercise. The findings of this study are in agreement to the above findings.

Discussions on hypothesis
There would be significant difference in selected physiological variables, mean arterial blood pressure due to yogic practices and brisk walking comparing to control group among diabetic patients.
There would be no significant differences between yogic practices and brisk walking in altering selected physiological variables among diabetic variables.
The results presented in Tables 4.5 on physiological variables mean arterial blood pressure respectively proved that the obtained F-values were greater than the required table F-value to be significant at 0.05 level. The post-hoc analysis results

presented in Tables 4.6 on the physiological variables proved that twelve weeks yogic practices and brisk walking significantly improved selected physiological variables, mean arterial blood pressure. The formulated hypothesis No. 1 stated that there would be significant difference in selected physiological variables mean arterial blood pressure due to yogic practices and brisk walking comparing to control group among diabetic patients was accepted at 0.05 level.

Conclusions

It was found that twelve weeks yogic practices and brisk walking significantly altered physiological variable, mean arterial blood pressure among diabetic patients and the comparisons between treatments groups proved that there was no significant difference between the experimental groups.

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