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Original Research Article

Utility of Amrut Pushti Vardhak powder in enhancing physical fitness

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ABSTRACT

Background: Physical performance depends on physical fitness. Fit persons can accomplish the tasks. Fitness is modifiable and hence the fitness level can be increased. In this background a need was felt to validate the efficacy of the Amrut Pushti Vardhak (APV) powder, a product developed by DFRL Mysore, for its physical performance enhancing activity by fitness tests. The result of pre-clinical study of the product was encouraging; hence clinical trial was taken up.
Methods: All norms of good clinical practice and ethics were abided. The subjects were assigned in two homogenous groups, as control and trial groups. The trial group was given APV powder 30 gms/day for 21 days in the morning. The other group served as negative control. To evaluate the efficacy modified Harward step test was conducted before and after the intervention.
Results: The test group showed statistically significant increase in the duration of exercise with p value 0.027 and increase in physical fitness index (PFI) with p value 0.01. The test group also showed statistically significant increase in the maximal oxygen consumption (VO_2 max) (p=0.004). The increase in physical fitness level can be attributed to ingredients of APV powder.
Conclusions: Healthy volunteers who received APV powder 30 gms/day for the duration of 21 days reported statistically significant increase in their duration of exercise, PFI and VO_2 max. This indicates the APV powder increases in the physical fitness level.

Keywords: APV powder, Physical fitness index, Maximal oxygen consumption, Physical performance enhancing activity, Harward step test

INTRODUCTION

Ayurveda is a unique science which has two-fold objectives as maintenance of health of healthy and curing the diseases.[1] Health and fitness are interconnected. Ayurveda has identified this long back and proposed swatha urjasara chikitsa, health promotive strategies which are aimed at increasing the level of fitness.[2] This is also known as rasayana chikitsa. Rasayana chikitsa includes drugs, medicinal formulations, therapeutic procedures and lifestyle management as important aspects.[3] Fitness is very essential because that decides the quality of one's life. Fit person can endure and show good performance physically. In relation to the health Physical Performance attain paramount importance. It is innate desire of everyone to be strong and physically fit to accomplish any task.

Physical fitness implies not only the absence of disabling deformity or disease and the capacity to perform a sedentary task efficiently but also a sense of physical wellbeing and the capacity to deal with emergencies demanding unaccustomed physical effort. Fitness is a

relative term. An individual is considered to be fit for a particular task or activity when he can accomplish it with a reasonable degree of efficiency, without undue fatigue and with rapid recovery from the effects of exertion.

Physical fitness

This is referred to as Dehabala in Ayurveda. Dehabala includes physical endurance too. This is generally defined as a general state of health and well-being or specifically the ability to perform aspects of sports or occupations. Primary sources to enhance physical performance are certain drugs, diet, age, somatotype and personality, correct nutrition, exercise, hygiene and rest. It is a set of attributes or characteristics that people have or achieve that relates to the ability to perform physical activity among these the important modifiable factors are the exercise and the nutrition.[4]

Harward step test

Exercise tests are widely used test to assess and evaluate physical fitness. Among them few important are, running on a treadmill, exercising on a bicycle ergometer, step test.[5] Harward step test is a special test that measures the general capacity of the body, in particular to the cardiovascular system that adapts itself to hard work and to recover from it. Because of its simplicity, step test has been used by several observers as a test for physical fitness. According to Astrand, step tests are conducted as one of the exercise tests for evaluation of maximal aerobic power in field studies or testing a large group of subjects. The objective of Harward step test was to measure physical fitness for muscular work and the ability to recover from work.[6]

PFI

It is used to evaluate the cardiopulmonary fitness; it is a powerful indicator cardiopulmonary fitness and there by physical performance. The regular exercise and nutritious food intake can increase PFI by increasing oxygen consumption.[7] Toddomino et al proposed the scoring pattern for the long form and short form. The PFI is calculated with this formula,

$$PFI=\frac{duration\ of\ exercise\ in\ seconds\times 100}{sum\ of\ pulse\ counts\ in\ recovery}.$$

VO_2 max

It is the term used to define the level of oxygen consumption beyond which no further increase in O_2 consumption occurs with further increase in the severity of exercise. It is also defined as the highest oxygen uptake an individual can achieve during exercise while breathing air at sea level. VO_2 max of a normal individual is limited by the degree to which cardiac output can increase and not by the ventilatory capacity or oxygen diffusion capacity of the lungs. The ability of the active tissues to extract O_2 delivered by circulation or peripheral factors (muscle mass) may be other possible limiting factors for VO_2 max.[8]

VO_2 max is the maximum capacity to transport and utilize oxygen during incremental exercise (Harward step test) (the derivation is V-volume per time, O_2-oxygen, max-maximum). It is also known as aerobic capacity, which reflects physical fitness of a person. Because oxygen consumption is linearly related to energy expenditure, when we measure oxygen consumption, we are indirectly measuring an individual's maximal capacity to do work aerobically.

Physical activity rating and fitness index

Table 1: The scoring pattern of PFI.

Score	Evaluation	Activity category
81 to 100	Very active lifestyle	High
60 to 80	Active and healthy	Very good
40 to 59	Acceptable but could be better	Fair
20 to 39	Not good enough	Poor
Under 20	Sedentary	

APV powder

DFRL Mysore developed a powder predominantly containing shatavari choorna with intent of enhancing physical performance and endurance capacity of defence personnel. The powder was subjected to pre-clinical studies for safety and efficacy in albino rats.

Objectives

The objectives were to evaluate the effect of APV powder on PFI and to evaluate the effect of APV powder on VO_2 max.

METHODS

It was a randomized, parallel group, single centre, controlled clinical study. The ethical clearance was obtained from the institutional ethics committee of Government Ayurveda Medical College, Mysore. With a purpose of reducing the confounders and obtain effective group match, the participants recruited were the residential students of hostel of Government Ayurveda Medical College, Mysore. The study began in October 2014 was completed in March 2015. Written informed consent was taken before conducting the study related procedures. Subjects were included in the study if indicated yes to all inclusion criteria and no to all exclusion criteria. A total of 70 healthy subjects registered for the trial. Subjects were randomly assigned in two groups in a 1:1 ratio comprising 35 in each group.

Inclusion criteria

Healthy young male and female subjects; aged between 18 to 25; willing to come for regular follow up; able to give written informed consent were included in the study.

Exclusion criteria

Intake of over-the-counter health supplements; patients with locomotor and musculoskeletal disorders; patients with history of cardiovascular diseases, history of diabetes mellitus, hypertension and bronchial asthma; history of major surgery in the past; history of anabolic steroids in the past 6 months; history of drug intake; history of alcohol and smoking; pregnant and lactating patients; patients with history of hypersensitivity to any drugs; volunteers who have participated in any other clinical trials during the past 6 months; or any other condition which the principal investigator thought may jeopardize the study were excluded.

Intervention

Subjects of group 2 received the following formulation whereas subjects of group 1 did not receive anything and they served as negative control.

Table 2: The intervention.

Groups	Volunteers	Drug	Test
Group I (control)	35	-	M Harward step test
Group II (trial)	35	APV powder	M Harward step test

APV powder procured from DFRL Mysore was administered 30 gms/day orally for 21 days with 100 ml of milk.

Materials for M Harward step test

Modified Harward step bench for male and female (used for step test exercise evaluation and to record the exercise duration in seconds during the procedure), sphygmomanometer, weighing machine, measuring tape, stethoscope, stop watch.

Method of collection of data

All the exercise data were collected during morning hours between 7 am to 9 am to avoid any possible diurnal variation effect. Subjects were told to report an hour before exercise. The details of the procedure of exercise test were explained to the subjects and actually demonstrated before, in order to allay apprehension. They were asked to refrain from eating or drinking at least for an hour and allowed to take rest for half an hour before exercise. Before the exercise test, the anthropometric and physiological parameters and physical examination of the subjects were recorded. All the data were recorded in case report form (CRF) for each subject. The recordings of the physical fitness parameters were made.

Recording of physical anthropometry

For each subject height, weight, body mass index were recorded.

Recording of Physiological Parameters

In each subject pulse rate, respiratory rate, systolic and diastolic blood pressure were recorded in pre- exercise and post-exercise conditions.

Recording of PFI by using modified Harward step test

PFI of each subject was recorded by using modified Harward step test with step height 40 cm for males and 33 cm for females, which was a wooden step, heavily constructed such that it remained steady always during the test. The observer called the rhythm, at the signal start stopwatch was started. The subject places one foot on the platform and later the other and immediately steps down, bringing down first the same foot which he placed up first. Subject was instructed not to touch anything with his hands but may move his arms freely. The subject was exercised at the rate of 22 times a minute for 5 minutes continuously unless he stopped from exhaustion.

The duration of effort to the nearest second was noted. All subjects were stopped at 5 minutes if they could go that long. Exhaustion was defined as when the subjects could not maintain the stepping rate for 15 per minute.

Immediately when the subject successfully completed the test pulse rate was recorded (Pmax). Radial pulse rate was recorded after 1, 2 and 3 minutes of test as P1, P2 and P3 respectively.

The PFI score was calculated as follows,

$$\text{PFI}=\frac{duration\ of\ exercise\ in\ seconds\times 100}{sum\ of\ pulse\ counts\ at\ 1,2\ and\ 3\ minutes}.$$

The VO_2 was calculated by sub maximal exercise heart rate using the Margania's equation,[9]

$$VO_2\ \text{max}=111.33-(0.42\times Pmax).$$

Data was collected before the intervention and after the intervention. It was compared and analyzed.

Statistical methods

Descriptive statistics, contingency coefficient test, repeated measures ANOVA, independent sample t test, paired sample t test. All the statistical operations were done through SPSS for Windows software.

Compliance with medication was reviewed by interrogation with the subject, friends and family members and observing the left-over medicine. The subjects were instructed not use any health supplements or other drugs during the study duration. No rigorous exercises were advised. Investigator verified and confirmed with the study subjects for the above restrictions.

One subject from the control group and 3 subjects from the trial group were excluded on account of poor compliance. Hence control group had 34 subjects and trial group 32.

RESULTS

Among 66 subjects, 24 were male and 42 were females. 14 subjects were 19-year age, 15 were of 20 years, 16 had 21-year age, 8 subjects were of 22-year age and 13 volunteers were of 23-year age. Mean height, weight and BMI of group I subject was 160.4±9.5 cm, 51.5±9.8 kg and 19.95±2.15 respectively and that of group II was 160.1±9.8 cm, 51.6±8.2 kg and 20.06±2.17 respectively.

Table 3: The effect of APV powder on duration of exercise.

Duration of exercise	Group	Mean	Std. deviation	N
Pre	I	244.6	65.7	34
	II	248.1	51.2	32
Post	I	245.2	51.3	34
	II	269.0	39.4	32

Table 4: The effect of APV powder on PFI.

PFI	Group	Mean	Std. deviation	N
Pre	I	67.5	15.9	34
	II	68.3	9.40	32
Post	I	68.3	9.16	34
	II	75.3	8.89	32

Table 5: The effect of APV powder on VO_2 max.

VO_2 max	Group	Mean	Std. deviation	N
Pre	I	43.29	6.45	34
	II	44.94	5.59	32
Post	I	45.3	5.65	34
	II	50.1	2.35	32

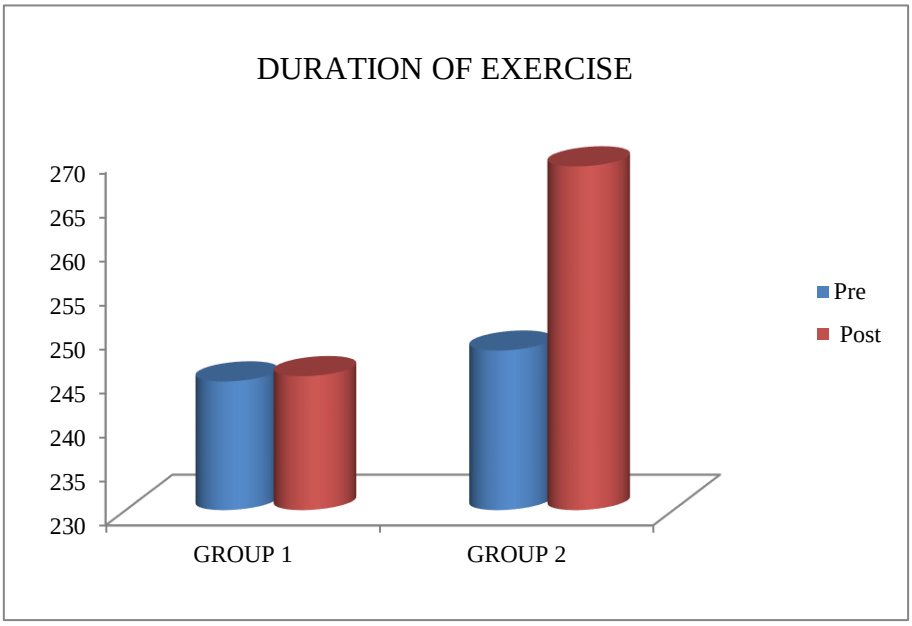

Figure 1: The effect of APV powder on duration of exercise.

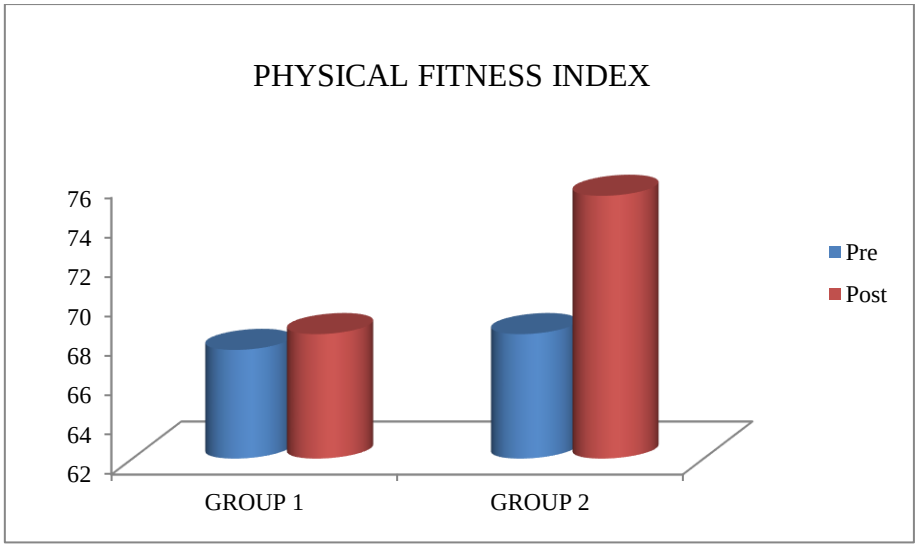

Figure 2: The effect of APV powder on PFI.

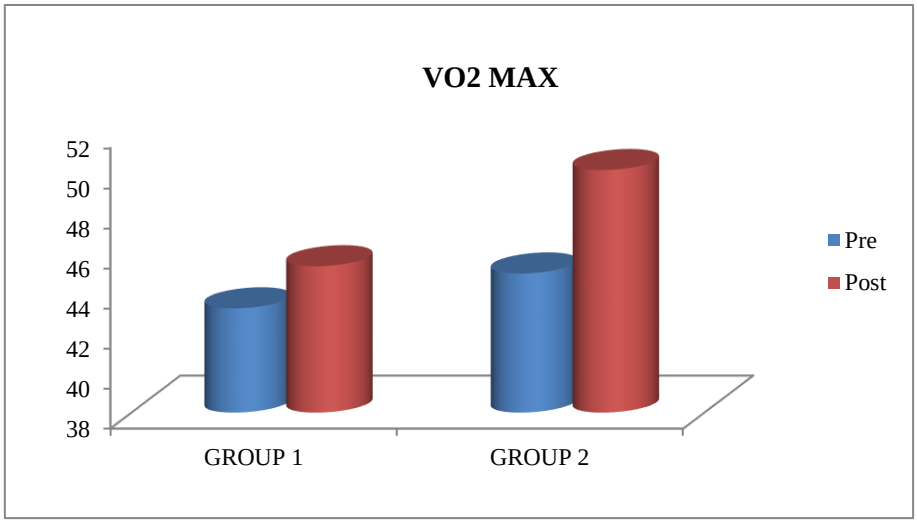

Figure 3: The effect of APV powder on VO_2 max.

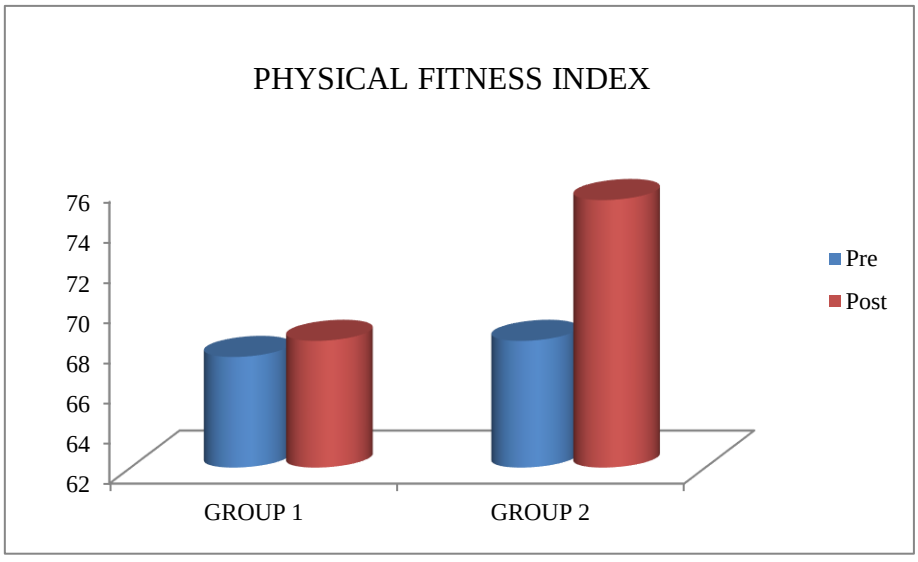

Figure 4: The effect of APV powder on PFI.

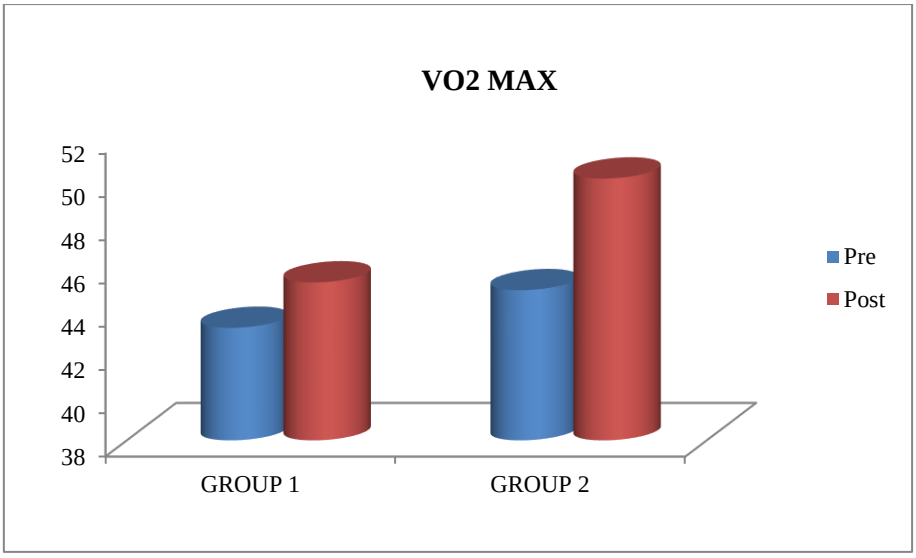

Figure 5: The effect of APV powder on VO_2 max.

The mean duration of exercise in test group was 248.1±51.2 seconds which increased to 269±39.4 seconds after the intervention. The duration of carrying out exercise in step test showed statistically significant change (p=0.027). Whereas duration in the control group was (table 2) 244.6±65.7 and 245.2±51.3 respectively (Table 2 and Figure 1).

The mean PFI in test group was 68.3±9.40 which increased to 75.3±8.89 after the intervention. PFI showed statistically significant change (p=0.01) (Table 3). Whereas PFI in the control group was (table graph) 67.5±15.9 and 68.3 ±9.16 respectively (Figure 2).

The mean VO_2 max in test group was 44.94±5.59 which increased to 50.1±2.35 after the intervention. The VO_2 max showed statistically significant change (p=0.004). Whereas duration in the control group, it was 43.29±6.45) and 45.3±5.65) respectively (Table 4 and Figure 3).

DISCUSSION

Maintaining and improving the health status of healthy person was the primary objective of Ayurveda. And it had a unique approach to promote fitness. It was titled as swastha urjaskara chikitsa. This intervention can be though ahara (food and nutrition), vihara (daily activities and lifestyle) and aushadha (medicines). In this clinical research the efficacy of aushadha in the form of amruta pushti vardhaka churna was being validated. To allay the confounders and in the form of food and lifestyle, the residential students were recruited to satisfy the requirement that all subjects receive same food and do similar activities. The yardsticks of fitness measure were many. Since the most important indicator of fitness was cardiopulmonary fitness, exercise test was employed. Because exercise tests were suited to evaluate cardiopulmonary fitness. The formulation basically contained asparagus which was said to be rasayana in Ayurveda. Since all rasayanas were indicated to be used for a period of mandala (48 or 42 days), here the duration was restricted to ardha mandala (21 days).[10] On administration for 21 days the trial group showed better results. The result obtained can be attributed to rasayana effect of shatavari. Shatavari had the qualities of reducing general fatigue, anger stress and increasing sexual energy.[11]

CONCLUSION

Healthy volunteers who received APV powder 30 gms/day for the duration of 21 days reported statistically significant increase in their duration of exercise, PFI and VO_2 max. This indicates the APV powder increases the PFI.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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