

## Comparison of Physical Fitness Index (PFI) between Spinning (indoor cycling) female practitioners and Zumba female practitioners using Modified Harvard's Step Test: A pilot study

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### ABSTRACT

**Background:** With increase in awareness about the importance of physical fitness, there has been considerable increase in proportion of population indulging in various new emerging forms of exercises such as Zumba and Spinning.

**Purpose of study:** To assess and compare Physical Fitness Index (PFI) between females practicing two newer forms of aerobic exercises Zumba (group 1) and Spinning (group 2) and to understand whether one aerobic activity has better PFI values over other and whether they can be used interchangeably. It will also create awareness regarding both the newer forms of aerobic exercise forms Zumba and Spinning and its effect.

**Method:** Healthy females practicing either Zumba and spinning for one year regularly were chosen. Step board of height 33 cm, metronome, stopwatch used. Modified Harvard Step test was explained and then subjects were asked to do it. Results were calculated and scoring was done.

**Results and Main findings:** The study showed that in (Group 1) Zumba practitioners 92.86% population had excellent PFI, 7.14% population had fair PFI. In (Group 2) Spinning practitioners, 100% subjects showed excellent PFI, Group 2 had evidently greater mean PFI than group 1 but not statistically significant. There was no statistically significant difference in PFI values between the subjects of two groups spinning and Zumba.

**Conclusion:** Majority of the population of both the groups showed Excellent PFI. Both the newer types of aerobic exercise forms can be used interchangeably depending on the age of population.

**KEY WORDS:** Zumba, Spinning, Modified Harvard's Step test, Physical Fitness Index, Females

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### INTRODUCTION

Exercise is a type of Physical activity consisting of planned, structured, and repetitive bodily movement done to improve and/or maintain one or more components of physical fitness [1].

Physical fitness has been defined in several ways, but the generally accepted definition is the ability to carry out daily tasks with vigour and alertness, without undue fatigue, and with ample energy to enjoy leisure-time pursuits and meet unforeseen emergencies [1].

## Health-related Physical Fitness Components are:

**Cardiorespiratory endurance:** It is the ability of the circulatory and respiratory system to supply oxygen during sustained physical activity [1].

**Body composition:** It is the relative amounts of muscle, fat, bone, and other vital parts of the body. BMI or the Quetelet index is used to assess weight relative to height and is calculated by dividing body weight in kilograms by height in meters squared [1].

**Muscular strength:** It is the ability of muscle to exert force [1].

**Muscular endurance:** It is the ability of muscle to continue to perform without fatigue [1].

**Flexibility:** the range of motion available at a joint [1].

CRF is related to the ability to perform large muscle, dynamic, moderate-to-vigorous intensity exercise for prolonged periods of time. Performance of exercise at this level of physical exertion depends on the integrated physiologic and functional state of the respiratory, cardiovascular, and musculoskeletal systems [1].

Cardiovascular fitness refers to the physical work capacity of an individual, in the form of amount of oxygen capacity per kilogram of body weight over time (ml/kg/min) [1] A person's ability to deliver oxygen to the working muscles is affected by many physiological parameters including heart rate, stroke volume, cardiac output and maximal oxygen consumption [2].

Aerobic exercise (also known as cardio) is a form of physical exercise of low to high intensity and refers to use of oxygen to adequately meet energy demands during exercise with stretching and strength training routines with goal of improving all elements of fitness (flexibility, muscular strength and cardiovascular fitness) [3].

Rhythmic, aerobic type exercises involving large muscle groups are recommended for improving CRF. The modes of PA that result in improvement and maintenance of CRF are Aerobic exercise frequency recommendation

as per ACSM guidelines is moderate intensity aerobic exercise done at least 5 days/week or vigorous intensity aerobic exercise done at least 3 days/week or a weekly combination of 3–5 days/week of moderate and vigorous intensity exercise is recommended for most adults to achieve and maintain health/fitness benefits [1].

With increase in awareness about the importance of physical fitness, there has been considerable increase in proportion of population indulging in various aerobic exercise forms. There are different forms of aerobic exercises like jogging, running, swimming, boxing and dancing [1].

As an alternative to traditional approach to physical exercises newer forms of exercises like Zumba and Spinning (indoor cycling) are developed.

Zumba programme is a Latin inspired dance fitness class that incorporates Latin and international music and dance movements creating dynamic, exciting, exhilarating effective fitness programme created by Alberto Beto Perez [4].

Zumba is a total body cardio and aerobic workout, which provides large calorie consumption. A study shows that with an hour-long Zumba researcher found that participating in a single Zumba fitness class burned an average of 369 calories or about 9.5 kcal per minute [5].

The Zumba programme integrates some of the basic principles of aerobic, interval and resistance training to maximise caloric output, cardiovascular benefits and total body toning. The cardio-based dance movements are easy to follow steps, which include body sculpting, which targets areas such as gluteus, legs, arms, core, abdominals and heart [4].

Each Zumba class is of 45 to 50 minutes duration involving warm up period of 5 minutes then main high intensity aerobic training of 30 to 35 minutes followed by cool down and stretching period of 3 to 5 minutes [4].

### BENEFITS OF ZUMBA FITNESS [4].

Improves resting heart rate.

Improves circulation.

Raises metabolic rate.

Helps to regulate cholesterol levels.

Muscular fitness has impact on muscular endurance and muscular strength.

Flexibility helps to reduce risk of injury, improves posture, less muscle tension and soreness.

Regular practice of Zumba seems to reduce the progressive deterioration of bone health in inactive women; these findings highlight the importance of implementing exercise programmes in pre-menopausal women to slow down the loss of bone mass with aging [6].

**Spinning (indoor cycling):** In 1991 Johnny Goldberg and John Baudhuin teamed up to refine the design and make first run spinner bikes [8].

In 1992, they both began manufacturing and commercial distribution of spinner bikes and Spinning program [8].

In 1994, Mad Dogg Athletics, Inc. (MDA) was incorporated and MDA registered and trademarked Spinning name [8].

In 1995, MDA launched Spinning instructor certification program, which became the gold standard for indoor cycling education and certification worldwide [7,8].

Each spinning class of 45 minutes duration involving warm up period of 5 to 7 minutes, main aerobic training of 30 minutes followed by stretching or cool down period of 5 minutes.

Different spinning positions involved in spinning class are seated flat, standing flat, jumps, standing climb.

Spinning (indoor cycling), helps to improve aerobic capacity [9].

Physical Fitness Index (PFI) is one of the most important criteria to assess the cardiopulmonary efficiency of the subject. Physical Fitness Index (PFI) is measured by Harvard's step test. It is also a good measurement of fitness and a person's ability to recover after a strenuous exercise by checking the recovery. Physical fitness is defined as ability to carry out daily tasks with vigour and alertness without undue fatigue with ample energy to enjoy leisure time pursuits, to meet unusual situations and unforeseen emergencies.

Determination of Physical Fitness Index PFI is one of the important criteria to assess the cardiopulmonary efficiency of the subject. The American Alliance for Health, Physical, Education Recreation and Dance (AAHPERD) recommended this test to study health related physical fitness programme in youth [9].

**Physical Fitness Index (PFI) is measured by Harvard's step test:**

The Harvard's step test is a type of cardiac stress test for detecting and diagnosing cardiovascular disease. It is also a good measurement of fitness and a person's ability to recover after a strenuous exercise by checking the recovery rate. It is a sub maximal cardiovascular endurance test. The test computes the capability to exercise continuously for extended intervals of time without tiring.

The standard 50.8 cm step of Harvard step test is tailored to western anthropometrics and is rather high for the average Indian whose height is relatively less. Therefore, the height of step is lower 33 cm in modified Harvard step test [10-13].

**Need of the study:** To compare Physical fitness index (PFI) between females practicing two newer forms of aerobic exercises Zumba (group 1) and Spinning (group 2) and to understand whether one activity has better PFI values over other and whether they can be used interchangeably. It will also create awareness regarding both the newer forms of aerobic exercises and its effect.

**Aim of the study:** To compare Physical Fitness Index (PFI) between two groups of female practitioners indulging in two different forms of aerobic exercise spinning and Zumba aging between 18 to 27 years using Modified Harvard's Step test.

**Objectives:** To assess Physical Fitness Index of Spinning female practitioners.

To assess Physical Fitness Index of Zumba female practitioners.

To compare both.

**Inclusion criteria:** Healthy females between age group 18 to 27, practicing Zumba or Spinning for one year regularly 3 to 5 times a week for 1 hour.

**Exclusion criteria:** Females practicing exercise forms other than Zumba and spinning.

Females practicing Zumba or spinning for less than a year.

Females having recent lower limb fractures, ligament injuries, cardio respiratory conditions, neurological conditions or any health risks.

## MATERIALS AND METHODS

Ethical clearance was taken from institute's ethical committee for the study.

**Study Design:** Cross sectional.

**Study Setting:** Gyms, sports clubs.

**Study Population:** Healthy Females of age group 18 to 28 years.

**Sample size:** 30

**Materials-** step board 33cm height, metronome, and stopwatch.

**Procedure** – Ethical approval was taken.

**Pre-test:** The subjects selected were screened for musculoskeletal injury, neurological and respiratory problems and were screened for health risks. Recording of basic information such as age, gender, height, body weight. Consent form was taken from the subjects. Modified Harvard's Step Test was explained and demonstrated for the subjects. The subjects had to step up and down on 33 cm step at a rate of 30 times/min for the duration not greater than 5 minutes.

Metronome and stopwatch were set, subject was asked to perform the test. Test was terminated as per the time of exhaustion of the subject and time was noted. Subject was made to sit down immediately.

**SCORING:** The subject immediately sits down on completion of the test, and the heart beats are counted for 1 to 1.5, 2 to 2.5, and 3 to 3.5 minutes.

The results are written down as time until exhaustion in seconds (te) and total heart beats counted (hb). It is plotted into a simple fitness index equation:

$te * 100 / hb * 2$  where te represents time of exhaustion

hb represents total heart beats counted.

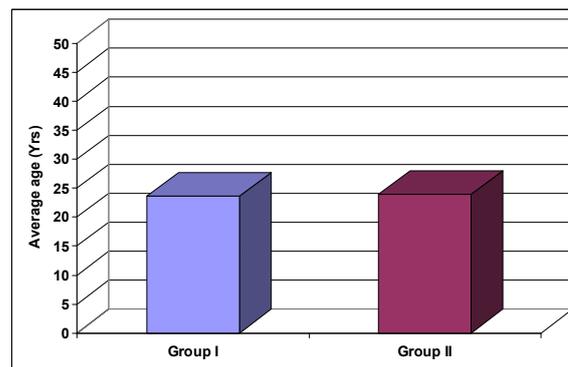
Following is the PFI rating: [10-13].

Physical fitness index	Rating
<77	Poor
77 – 83	Fair
84 – 91	Good
>91	Excellent

## RESULTS AND GRAPHS

**Table 1:** Comparison of age in group I and group II.

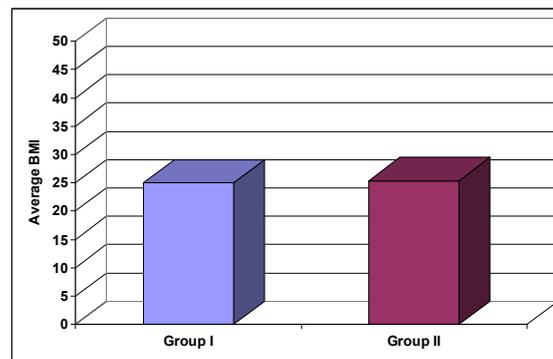
Parameter	Group I (n=14)		Group II (n=14)		t Value	P Value
	Mean	SD	Mean	SD		
Age (Years)	23.64	2.735	23.93	1.774	0.33	0.75



The data of the two groups was compared using unpaired 't' test. The above table and graph show that the mean age of group 1 (Zumba group) was 23.64 with standard deviation of 2.735 and that of the group 2 (spinning group) was 23.93 with standard deviation of 1.774. There is no significant difference of age between group I (Zumba) and group II (Spinning) as  $P > 0.05$  i.e., mean age was same in both the groups.

**Table 2:** Comparison of Body Mass Index in group I and group II.

Parameter	Group I (n=14)		Group II (n=14)		t Value	P Value
	Mean	SD	Mean	SD		
BMI	25.04	3.721	25.41	3.593	0.27	0.79

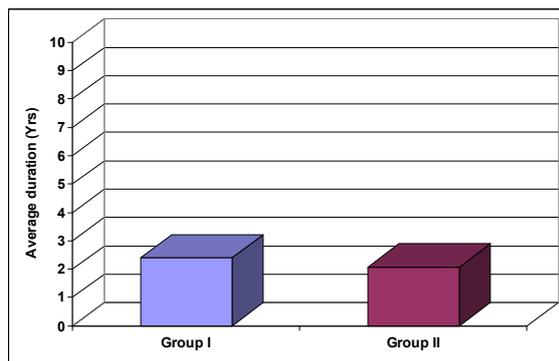


The data of the two groups was compared using unpaired 't' test. The above table and graph show that the mean of group 1 (Zumba

group) was 25.04 with standard deviation of 3.721 and that of the group 2 (spinning group) was 25.41 with standard deviation of 3.593. There is no significant difference of BMI between group I (Zumba) and group II (Spinning) as  $P > 0.05$  i.e., mean BMI was same in both the groups.

**Table 3:** Comparison of duration in group I and group II.

Parameter	Group I (n=14)		Group II (n=14)		t Value	P Value
	Mean	SD	Mean	SD		
Duration (Years)	2.39	1.443	2.07	0.475	0.78	0.44

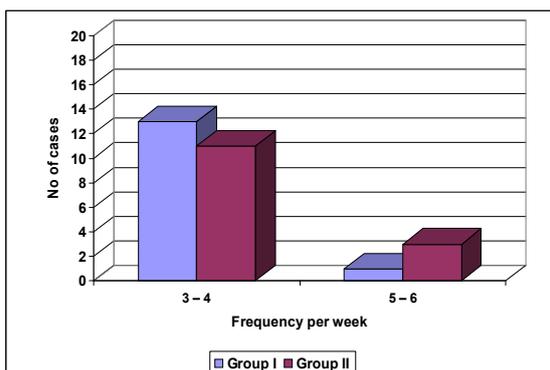


The data of the two groups was compared using unpaired 't' test. The above table and graph show that the mean duration of group 1 (Zumba group) was 2.39 with standard deviation of 1.443 and that of the group 2 (spinning group) was 2.07 with standard deviation of .475. There is no significant difference of duration between group I (Zumba) and group II (Spinning) as  $P > 0.05$  i.e., mean duration was same in both the groups.

**Table 4:** Frequency wise distribution of cases in group I and group II.

Frequency per week	Group I (%)	Group II (%)	Total (%)
3 – 4	13 (92.86)	11 (78.57)	24 (85.71)
5 – 6	1 (7.14)	3 (21.43)	4 (14.29)
<b>Total</b>	<b>14 (100)</b>	<b>14 (100)</b>	<b>28 (100)</b>

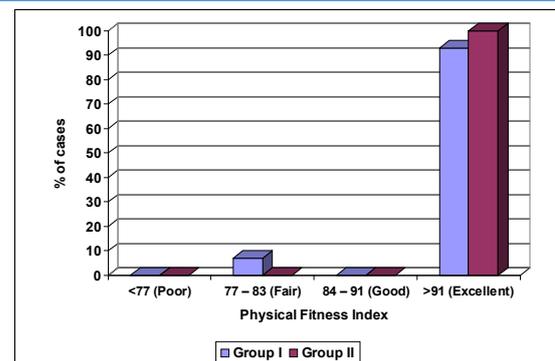
Fisher exact test:  $P = 0.59$



The data of the two groups was compared using fisher exact test. The above table and graph show that there is no significant association of frequency per week between group I (Zumba) and group II (Spinning) as  $P > 0.05$ .

**Table 5:** Assess the Physical Fitness Index (PFI) in group I and group II.

PFI	Group I (%)	Group II (%)	Total (%)
<77 (Poor)	0	0	0
77 – 83 (Fair)	1 (7.14)	0	1 (3.57)
84 – 91 (Good)	0	0	0
>91 (Excellent)	13 (92.86)	14 (100)	27 (96.43)
<b>Total</b>	<b>14 (100)</b>	<b>14 (100)</b>	<b>28 (100)</b>

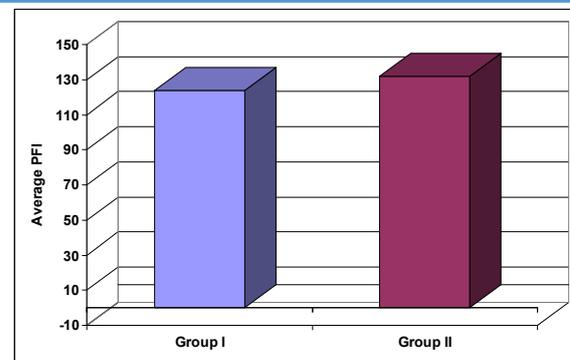


The above table and graph show that majority 13 (92.86%) subjects had excellent PFI, 1 (7.14%) subject had fair PFI, no one had good and poor PFI while in group II (Spinning) 14 (100%) subjects had excellent PFI, no one had good, fair, poor PFI.

In total it was found that out of 100% subjects, 3.57% of subjects accounted for PFI <77 (Fair) and 96.43% of subjects accounted for PFI >91 (Excellent).

**Table 6:** Comparison of physical fitness index in group I and group II.

Parameter	Group I (n=14)		Group II (n=14)		t Value	P Value
	Mean	SD	Mean	SD		
PFI	123.91	20.12	131.85	20.5	1.03	0.31



The data of the two groups was compared using unpaired 't' test. The above table and graph show that the mean of group 1 (Zumba

group) was 123.91 with standard deviation of 20.12 and that of the group 2 (spinning group) was 131.85 with standard deviation of 20.50. Group 2 (spinning group) had evidently greater mean PFI than group 1 (Zumba group) but not statistically significant as  $P > 0.05$ .

## RESULTS AND DISCUSSION

The purpose of the study was to compare the Physical Fitness Index (PFI) between female practitioners aged 18 to 28 years, indulging in two different forms of aerobic exercises: Zumba female practitioners (group 1) and Indoor cycling (Spinning) female practitioners (group 2).

Results showed that there is no significant difference between the PFI of the two groups. According to the statistical analysis both the groups were comparable with respect to age, BMI, duration of the exercise, frequency per week.

There was no significant difference between the PFI of the two groups. PFI values of both the groups were found to be  $\geq$  (excellent) No one in both the groups had poor PFI value.

Compared to the population with normal BMI, participants with higher BMI had PFI values slightly lower. One subject in Zumba group showed fair PFI as BMI was less than normal range; test termination was also early as compared to other individuals with normal BMI.

Though the mean BMI of both the groups was same, it was observed that compared to the population with normal BMI, subjects with higher BMI  $\geq 25$  the PFI values were slightly on the lower side. Previous studies have also proved the same relation that is BMI is inversely proportional to PFI.

As the effect of any exercise form depends on components of exercise: frequency, intensity and duration, in both the groups minimum 1 year practice was chosen as inclusion criteria. Hence both the groups were well trained in their respective exercise forms. This could be the reason for obtaining the above results.

Therefore, two exercise forms can be used interchangeably as per age of females. Studies have proved that, women who do

regular practice of Zumba which is a high impact exercise, increased bone mineral content and bone mineral densities exercises in form of jumps, loading are known to improve bone health and reduce bone loss., which in turn causes bones to adapt to force and stress produced during exercise, hence increases the strength. Hence regular practice of Zumba seems to reduce the progressive deterioration of bone health in middle aged women. Thus, it tells importance of implementing Zumba in premenopausal women to slow down loss of bone mass with aging [6].

On the other hand, spinning is low impact activity, there is no generation of ground reaction force, loading of joints is less, can be prescribed to middle aged or post-menopausal population.

Thus, two different types of aerobic exercises can be used interchangeably as per age and other physical, physiological factors of the population.

**Limitations:** Only female population was assessed. BMI was calculated on basis of Quetelet's Index.

**Future scope:** Can be done on larger sample size. Male population can also be involved.

## CONCLUSION

There was no significant difference in PFI values between the subjects of two groups Zumba and spinning. Majority of the population practicing both the aerobic activities Zumba and spinning showed excellent Physical Fitness Index. Both aerobic forms of exercises can be practiced interchangeably depending on population.

## ABBREVIATIONS

**PFI:** Physical Fitness Index

**MHST:** Modified Harvard's Step Test

**BMI:** Body Mass Index

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**Conflicts of interest: None**

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