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Physical Fitness Index of Indian Judo Players assessed by Harvard step test.

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Abstract:
Background: *Judo is a sport which is characterized by the indirect application of force to defeat an opponent. Physical fitness is the nucleus of sports. In combative games like judo physical fitness plays an important role.*
Objective: *To assess the physical fitness index in Indian Judokas by Harvard step test and also to compare fitness with sedentary controls.*
Method: *31 Judo players divided into two groups depending on duration of training and age and sex matched 31 controls were the participants in this study. Height, weight and BMI were calculated. Physical fitness index was calculated using Harvard step test. Students unpaired't' test, where significance of the p value was < 0.05 was used to compare two groups and strength of association between performance (number of throws) in special judo fitness test (SJFT) and physical fitness index (PFI) Karl Pearsons correlation coefficient was calculated.*
Results: *Senior group players (group B) showed a significantly higher physical fitness index than the juniors. The judo player group showed higher index than the controls. Positive correlation was seen between PFI and number of throws in SJFT.*
Conclusion: *Duration of training period certainly have positive effect on physical fitness levels and can be used to discriminate properly higher and lower level judo players.*
Keywords: *Harvard step test, Judo, Physical fitness index,*

I. Introduction

Judo "The way of gentleness". The soft method is characterized by the indirect application of force to defeat an opponent. The prominent feature is its competitive element, where the object is to either throw one's opponent to the ground, immobilize or otherwise subdue one's opponent with a grappling maneuver, or force an opponent to submit by joint locking the elbow or by executing a choke. [1]

Physical fitness is the nucleus of sports. Physical fitness of a player is affected by age, sex, diet and environment. Proper co-ordination of these factors can lead a player to the peak performance. In combative games like judo physical fitness plays an important role. A Judokas has to do punching and footwork with high speed. For this purpose physical fitness is most essential. Because Judo is a combative game, in this game to dominant the opponent and to protect himself physical fitness is essential. [2]

In general physical fitness is the prime criterion for survival, to achieve any goal and to lead a healthy life. Physical fitness can be recorded by cardiopulmonary efficiency test like Physical Fitness Index (PFI %) which is a powerful indicator of cardiopulmonary efficiency.[3] The American Alliance for Health, Physical, Education Recreation and Dance (AAHPERD) recommended this test to study health related physical fitness programme in youth.[4] Physical fitness has been described in many ways. It is a multidimensional concept that has been defined as a set of elements that people acquire that relates to the capability to perform physical activity. It is comprised of skill related, health related and physiologic components. Effect of exercise to have a good physical fitness is well known since ancient Vedas. But does duration of training has any effect on physical fitness levels is still not very clear in judokas so, this study was undertaken to assess the effect of duration of training period on physical fitness index in Indian Judokas.

II. Material and Methods

The present cross sectional study was conducted in the Department of Physiology in a JN Medical College, Belgaum.

Description of participants

Using universal sampling 31 Judo players who regularly practiced for a minimum period of 3 years and who were in the age group of 18-25yrs were included and 31 controls age (18 – 25 yrs) and sex matched

participants from first year MBBS were selected by randomization. Further based on number of years of judo training 31 judo players were divided into two groups Judo A (**≤ 5 years)** and Judo B **(> 5 years** of training). Participants with respiratory, neuromuscular, cardiac, endocrine disorders and students from comparative group who practice regular exercise regime were excluded from study. Descriptive data of the participant's age, medical history, training schedule regarding number of years of judo practice, and dietary history were obtained by questioning the participants. Nature of the study was explained and written informed consent was obtained from them. The study was approved by the Ethical and Research Committee of the institution.

Procedure

Baseline parameters height, weight and BMI were recorded from the participants. BMI is derived from body mass and stature to assess normalcy for body weight and is calculated by dividing body weight in kilograms by height in meters squared also called Quetelet Index. PHYSICAL FITNESS INDEX (PFI) was calculated on Harvard step test which required step 20 inches high stopwatch, metronome gives beat every 2 seconds at a rate of 30 per minute. The subject steps up and down on the platform at a rate of 30 steps per minute (every two seconds) for 5 minutes or until exhaustion. Exhaustion is defined as when the athlete cannot maintain the stepping rate for 15 seconds. The athlete immediately sits down on completion of the test, and the total number of heart beats is counted between 1 to 1.5 minutes after finishing. Total test time in seconds was noted down. [5,6]

Scoring: the Fitness Index score is determined by the following equations

Physical Fitness Index (PFI) = $\frac{100 \text{ X test duration in seconds}}{5.5 \text{ X pulse count between 1 and 1.5 minutes}}$

Special Judo Fitness test which was done on the same judo participants in our previous work, the total number of throws in that particular test was correlated with physical fitness index. [7] **Statistical analysis:** Statistical analysis involved quantitative variables summarized through mean and standard deviation. Difference between mean of the two groups was tested using Students unpaired't' test, where significance of the p value was < 0.05. To evaluate strength of association between performance (number of throws) in special judo fitness test and physical fitness index (PFI) among Judo players Karl Pearsons correlation coefficient was calculated.

III. Results

Judo A group consisted of 20 players (14 males and 6 females) and 11 players in Judo B group (5 males and 6 females). Mean age of players in judo A group (19.5 yrs) and judo B group(21 yrs) in this study. Mean age of our participants in judo group was 20.1years whereas in control group it was 18.7 years. Basic parameters height and weight recorded by standard protocol and BMI was calculated.

Harvard step test findings among Judo groups show mean test time was high for Judo B group. Mean Heart rate between 1 – 1.5 min was less in Judo B group than A group the difference was found to be statistically significant ($p < 0.05$). Physical fitness index (PFI) score was found to be significantly more in Judo B group than A group ($p<0.05$). (Table 1)

When compared with controls mean of total test time and (PFI) of Harvard step test was more in judo players than control group with a statistically significant difference ($p < 0.05$). Increase in Heart beat between 1 to 1.5 minutes was low for judo players than controls. Difference between two groups was again significant ($p < 0.05$) as shown in Table 2.

Correlation between total number of throws in Special Judo Fitness Test [7] and PFI it was seen that there was positive correlation between PFI and performance. (figure 1)

Table 1. Base line parameters and outcome of Harvard step test among Judo players (mean± SD) (n=31)

VARIABLES	JUDO A**(≤ 5 yrs)**	JUDO B**(> 5yrs)**	p Value
Height (cms)	166.8 ±7.09	158.5 ± 15.34	0.047
Weight (kg)	61.8 ± 8.53	59.7 ± 11.53	0.578
BMI	22.4 ± 1.90	24.1 ± 4.88	0.177
HARVARD STEP TEST			
Test time (sec)	282 ± 36.61	288.3 ± 27.39	0.619
Heart beat b/w 1 to 1.5 mins	61.5 ± 7.08	55.3 ± 7.26	0.026*
PFI score	83.9 ± 14.31	97.1 ± 17.67	0.032*

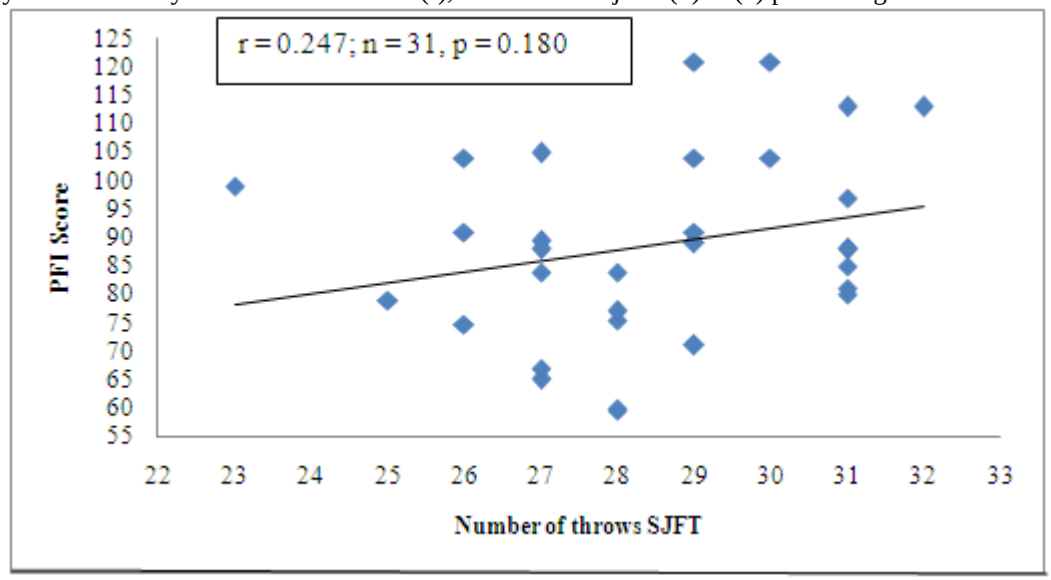
(*) p value significance = < 0.05

Table 2 Baseline parameters & results of Harvard step test of judo and control groups (mean± SD)(n= 62)

Anthropometric Variables	JUDO Group	Control group	p Value
Height (cms)	163.9± 11.25	168.6 ± 9.93	0.087
Weight (kg)	61.1 ± 9.56	63.3 ± 9.51	0.368
BMI	23 ± 3.31	22.3 ± 2.65	0.377
HARVARD STEP TEST			
Total Test time (sec)	284.2 ± 33.29	211.5 ± 82.16	0.000*
Heart beat between 1 to 1.5 mins	59.3 ± 7.66	73.5 ± 8.33	0.000*
PFI	88.6 ± 16.56	54 ± 23.37	0.000*

(*) p value significance = < 0.05

Figure 1 Shows relationship between PFI Score and number of throws in the Special Judo fitness test in all Judo players in this study. Pearson correlations (r), number of subjects (n). (*) p value significance = < 0.05



IV. Discussion

One is "**physically fit**" if they have the ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure time pursuits and to meet unforeseen emergencies.[8] Judo is the principle of using one's opponent's strength against him and adapting well to changing circumstances. The basic concept behind the sport of Judo is to use an opponent's strengths to one's own advantage and to take advantage of an opponent's weaknesses to achieve recognized control over that opponent.[9] Studies in young judo players consider that physical fitness as a requisite for high performance in this game.[10]

Harvard step test introduced by Brouha et al is widely regarded as a useful test of fitness for strenuous exercise in young men and with appropriate modification in young women.[11] Physical fitness has three main aspects. These are static fitness (absence of disease), dynamic fitness (ability to perform strenuous work) and motor skills fitness. Of these three, the dynamic fitness is very important in athletes which can be measured by Harvard step test.[12] In our study finding of Harvard step test were significant suggesting faster recovery in senior players (B group) due to aerobic training. Longer duration of practice might be contributing to the high PFI in senior group. Fitness index is directly proportional to the duration of exercise and inversely proportional to post exercise pulse counts. The higher PFI score in player group than controls proves that definitely the players are more physically fit than the controls that is attributed to the effect of their training sessions.

When correlation between total number of throws in Special Judo Fitness Test and PFI positive correlation was observed between PFI and performance showing a directly proportional relation between physical fitness levels and the players performance in their actual sport. Outstanding sport achievements are rare and require much effort and commitment. Many athletes struggle to achieve them, to break through various kinds of human limits, but only a few are successful. And their triumphs are ever more dependable on recent advances in sport training technologies and scientific findings. Thus, behind every prominent sport achievement, either individual or team, there is a team of experts and a thoroughly elaborated training programme. Individualisation of a training programme depends on an insight the coach can get into an athlete's actual state of physical fitness and on the data obtained from regular monitoring during the process of sport preparation. A proper choice of tests should provide diagnostic insights into the morphological, motor and functional components of athletic fitness.[13,14]

V. Conclusion

We conclude from our study that duration of training period certainly have positive effect on physical fitness and can be used to discriminate properly higher and lower level judo players. Values of PFI are substantially superior or higher than normative values for similarly aged untrained individuals owing to training.

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