

Research Paper

PHYSIOLOGICAL PROFILE OF NOVICE WEIGHTLIFTERS FROM WESTERN MAHARASHTRA

Prof.Sawant V. A

Department of Zoology, Shivaji University, Kolhapur

Prin.Masale B. S

Princess Padmaraje Junior college, Kolhapur.

Abstract

Weightlifting is a game of strength, speed and technique. It is largely practiced all over the world. In the present study, attempts have been done to study physiological profile of novice weightlifters. We have measured various anthropometric and physiological parameters such as height, body weight, grip strength, blood pressure, etc. We have found that practicing of weightlifting significantly increases strength, aerobic capacity and cardiovascular efficiency as training period increases. It is also observed that adaptations due to weightlifting are gender specific.

Key words: grip strength; peak expiratory flow rate; physical fitness; heart rate; weightlifting.

1. INTRODUCTION

Weightlifting is one of the most ancient sports in India. Its popularity is increasing day by day in all states of India. Now a day number of individuals are participating and practicing a game of weight lifting in India. It is an Olympic game which is finite, i.e. the winner is the person who can lift the heaviest weight above the hand a form strict enough to satisfy the tree judges. It is an exciting sport. It requires great strength, speed, mental control, fitness and courage and mastery of technique. The rapid development of modern weightlifting during the last two or three decades is a logical result of the increasing implementation of the achievement of science and technology in the domain of sport. The basic must be present to achieve success in different sports (Astrand, 1986). As reported by Wilmore (1999), the choice of sportsmen for particular event is largely determined by the inborn characteristics. Weightlifting is a game of strength, speed and technique. Weightlifting is defined as the sport in which athletes attempt to lift the most weight snatch and the clean and jerk. Strength and conditioning professionals should be clear to differentiate between weightlifting and weight training which is the broad category of exercise against resistance. The term Olympic lifting, although commonly used is inappropriate for most athletes as this should be reserved for the elite individuals who compete in weight lifting at the Olympic games and the term weightlifters refers as an individuals training and competing in weight lifting (Chiu and Schilling, 2005). As proposed by Newton and Dugan (2002), seven independent qualities contribute to an athlete's power capacity: maximum strength, high-load speed strength, low-load speed strength, rate of force development, reactive strength, skill performance, and power endurance. Each sport requires various combinations of these strength qualities, and this characterizes how power is best developed to match these demands. Therefore, all the strength qualities should be taken into account when evaluating the power profile of athletes, and the focus of training should be set from the point of not only specificity of a sport but also the individual athlete's capacity in each of these qualities (Newton and Kraemer, 1999). Ford et al (2000) have studied the gender and height related limits of muscle strength in world weight

lifting champions. Their research concludes that a nearly constant fraction of body mass devoted to muscle in lighter lifters and lesser fraction in heavier lifters. They also observed that contractile tissue comprises 30% less body mass in female champions. Many sport scientists (Sidhu 1985; Devi S. 2006;) studied the physical structures of the national and international weight lifters to know the typical body structure in relation to the events by considering anthropometric measurement. The survey of literature showed that very little work has been done on novice level i.e. the beginners, weightlifters from the point of view of physical fitness and performance. Not only that there is very scanty data on physiological profile of the Indian novice level male and female weightlifters. On the contrary, voluminous data have been reported on body size, shape and composition of sports man and sport women belonging to different sportive categories.

2. SIGNIFICANCE OF THE STUDY

Weightlifting is most remarkable type of sports. If we trace the history of sport of weightlifting, we found that it came into existence somewhat 100 years ago at the international level. The form in which it was played 100 years ago has undergone very minor changes. The sport of weightlifting at the international level is administered by the 'International Weightlifting Federation' (IWF) All the member countries affiliated to IWF are practicing the sport of weightlifting. As compared to other sports, it is the only event involving the use of heavy weights that is part of Olympic game. There are many misconceptions about the weightlifting sports like only strongest men and women in the world compete in weightlifting, it is dangerous game, it has very high injury rate, Drug usage is very rampant in the sport of weightlifting, etc. Actually, weightlifting is the only game that challenges strength, skill, flexibility and mental power fully as compared to other sports. India has been participating in the weightlifting event at the Olympic game since long. The performance of Indian weightlifters at the Olympic Games and other international competitions is not up to satisfaction. The major reasons behind that is less attention paid to the health status, diet, proper training, etc. Weightlifters are facing various stress problems during the training and competition. These problems are to be addressed with highest priority. There is an urgent need to carry out research

to address the stress problems, training sessions and physiological adaptations due to training and exercise. The various stress factors are mainly responsible for enormous health problems in weightlifters playing in different weight class. The performances of weightlifters are affected by weight gain or weight reduction before competition. There is need of proper training and exercise to weightlifters to minimize injuries during and after the competition and during daily training. After carefully studying present scenario of training, we have noticed that little attention have been paid on physiological adaptations in weightlifters due to training and exercise. The present study has been carried out to evaluate physiological profile, training and adaptations in weightlifters in response to exercise. The present investigation will be useful for all sports persons in general and for weightlifters in particular from the point of view of assessment of the physical fitness as well as specific sports performance. The present study has great physiological significance with respect to the selection criteria for the weightlifters for scientific screening for competition. The research work will also have great significance for proper exercise programmer. The observations made in the present investigations will be useful for sport coaches for supervising and training of weightlifters for their best performance.

3. MATERIALS AND METHODS

3.1 Study Area

The present study was carried out at various gymnasiums from Kolhapur, Sangli, Satara districts. Digvijay Vyayamhala, Sangli, Hercules Gymnasium, Kurunwad, Bibhishan Patil fitness Gymnasium, Kolhapur, New Shivaji Mandal's Gymnasium, Satara and Balbhim Gymnasium, Karad are the leading gymnasiums from western Maharashtra. About 150 male and female weightlifters were taking training of weightlifting at above mentioned gymnasiums.

3.2 Selection of Subjects

For the purpose of the present study, survey of various sports clubs, gymnasium halls was done. A detailed questionnaire was used to obtain information of weightlifters regarding age, sex, methods of exercise, diet habits, injuries, procedures followed for the preparation of competitions, etc. The weightlifters from above mentioned gymnasiums/sports clubs were selected randomly by giving proper weightage to different age groups, localities. The general study was conducted of these selected subjects and cross sectional data was obtained for detailed physiological studies. The subjects were 13 to 21 years old, both male and female.

3.3 Data Collection

The samples of present study consist of 33 male and 25 female novice level weightlifters practicing and taking weightlifting training for at least one year. For the purpose of study, we have divided them into two categories based on their training period as junior and senior novice weightlifters. Novice junior means a lifter with less than one year of training and senior means more than one year of training. The weightlifters under training from various training center of western Maharashtra (India) volunteered themselves for the present study in age from 13 to 19 years have been examined for the physiological profile. Anthropometric measurements such as age, body, weight, standing height were recorded with standard techniques of measuring and weighing. The cardiovascular efficiency was determined by Harvard's modified step test method. It was developed by the Harvard Fatigue Laboratory. The test

involved stepping up and down on a 45" bench continuously for 5 minutes at a rate of 30 steps/minute or until exhaustion or until the person can no longer maintain the stepping rate. The fitness score is computed by using the formula: min. after exercise

2
1
5.5 Pulse count 1-1
Duration of Exercise in Sec. 100 0.8
Fitness Index

?
???
The Harvard Step Test score is given a rank/grade as shown below:

4
Male > 90 80-89 65-79 55-64 < 55
Female > 86 76- 86 61 - 75 55- 60 < 50
Rank / Grade Excellent Good High Average Low Average Poor

The measurements of grip strength were recorded by using grip dynamometer for both right and left hands in both vertical and horizontal positions. The blood pressures of weightlifters were recorded by "Sphygmomanometer" before exercise and after exercise. The lung function test was carried out by using peak flow meter. Statistical constants such as mean, standard deviation (S.D.) of each variable were calculated.

4. RESULTS AND DISCUSSION

The level of fitness of individual weightlifters generally depends on many factors such as age, diet, environmental conditions, etc. It should be realized that physiological not chronological age is the real factor which influences the capacity for muscular work. For adolescents, there is a much higher correlation between the ability to perform hard exercise and the size of the individual than with his age. In present study physiological profile of novice level male and female individual were compared. The physical characteristics of the weight lifters are presented in table No. 1. Mean age of the subjects were 17.50 and 17.80 for junior and senior novice male weightlifters. For female novice junior and senior weightlifters, average ages were 15.50 and 18.50 respectively with little variation. Low variation in age indicates that the sample of subjects under study was a homogeneous group.

Table No. 1: Anthropometric Measurements of novice junior weightlifters. Parameter \Sex Men Women
Age (years) 17.50 ± 1.10 15.50 ± 1.78
Height (cm) 163.50 ± 7.50 152.7 ± 9.36
Weight (kg) 62.40 ± 8.80 49.96 ± 7.70

Table No. 2: Anthropometric Measurements of novice senior weightlifters.
Parameter \Sex Men Women
Age (years) 17.80 ± 1.90 18.7 ± 3.9
Height (cm) 161.40 ± 9.20 155.6 ± 5.2
Weight (kg) 64.8 ± 21.60 56.5 ± 12.3

Table No. 3: Muscular strength and power of Novice junior weightlifters
Grip strength (kg) Male Female
Right Hand Left Hand Right Hand Left Hand
Vertical 40.00 ± 3.90 37.80 ± 3.50 30.3 ± 6.06 29.20 ± 6.37
Horizontal 37.90 ± 4.00 36.30 ± 3.70 30.6 ± 7.34 27.50 ± 7.34

5
Male weightlifters are heavier in body weight as compared to female while female weightlifters are shorter in stature than the male weightlifters.

Table No. 4: Muscular strength and power of Novice senior weightlifters

Grip strength (kg) Male Female
 Right Hand Left Hand Right Hand Left Hand
 Vertical 43.61±10.88 40.52±10.03 36.87± 4.08 35.20±6.22
 Horizontal 43.43±9.89 43.57±8.38 34.73±3.79 34.00±3.25
 Grip strength of the weightlifters is exhibited in table No. 2 and 3. Mean

vertical grip strength of Male junior weightlifters was 40 kg and 39.8 kg for right and left hand respectively. In horizontal position it was 37.9 kg and 36.3 kg respectively. In female weightlifters vertical grip strength was 30.3 kg and 29.2 kg for right and left hands respectively. In horizontal position it was 30.6 kg and 27.5 kg respectively right and Left hand.

Table No. 5 Aerobic capacity of Novice junior weightlifters
 Parameter Male Female

Max. H.R. 120.90 ± 4.72 107.20 ± 35.05
 Recovery H.R. 86.70± 5.50 90.60 ± 6.98
 PEFR 491.00 ± 39.85 398.00 ± 16.87
 Systolic B.P. 150.3 ± 8.80 146.8 ± 6.94
 Diastolic B.P. 84.7 ± 3.50 87.7 ± 4.11

* H. R. – Heart Rate, B. P. – Blood Pressure, PEFR- Peak Expiratory Flow Rate

Table No. 6 Aerobic capacity of Novice senior weightlifters
 Parameter Male Female

Max. H.R. 112.2± 10.8 93.93±10.25
 Recovery H.R. 86.7±4.5 81.80±5.77
 PEFR 493.00±93.00 400.67±36.10
 Systolic B.P. 140.60±8.00 119.53±7.39
 Diastolic B.P. 86.8±5.3 79.73±6.31

The static heart rates of the weightlifter were measured immediately after the bout of exercise. It was observed that heart rate increases but the quantities by which it increases for male and female weightlifter were quite significant which may be due to regular exercise. The PEFR values for both categories of weightlifter were found to be higher than the standard values which indicates that weightlifters were having very good lung capacity. But comparison between male and female shows that male have more lung capacity than female. Huy Phum (2006) have reported that during resistive challenge such as weightlifting there is marked changes in BP. In present study, it has observed that both systolic B.P. and diastolic B.P. increase from baseline mean of 150.3 mm Hg to various quantities with maximum of 146.8 mmHg for male and female weightlifters

6

According to the classification of Zurairie M. et al (2006), the cardiovascular efficiency of the weightlifters, measured by Harvard's modified step test, was found to be of high average category for male and female.

Table No. 7: Fitness Score of novice junior and senior weightlifters

Parameter Fitness Score Classification
 Novice Junior Male weightlifters 72.15 ± 6.25 High Average
 Novice senior Male weightlifters 74.70 ± 9.10 High Average
 Novice Junior Female weightlifters 68.79 ± 9.98 High Average
 Novice senior Female weightlifters 70.28 ± 7.41 High Average

In present study physical fitness of novice level male weightlifters compared with female weightlifters. The male weightlifter is more physically fit. Generally speaking of young children up to the age of 10 to 12 years there is no significant difference in strength for both male and female but there is a trend for males to be stronger after this age. Body becomes continuously stronger for some years while the

women do not improve much in muscle strength. The most likely explanation of this difference in development is the greater secretion of hormone testosterone in the male. Male and female show marked differences in their physiological capacity to perform hard exercise. Table No. 8. Sex-wise P-values for all Parameters

Parameter P-value
 Male Female
 Age 0.2675* 0.0058**
 Height 0.0124 0.1946*
 Weight 0.3257* 0.0589**
 Fitness Score 0.000003 0.0020
 Grip strength Right Vertical 0.0077 0.0702**
 Grip strength Left Vertical 0.0022 0.0709**
 Grip strength Right Horizontal 0.0263 0.0191
 Grip strength Left Horizontal 0.0643** 0.0920**
 After exercise Heart Rate 0.0015 0.1359*
 Blood Pressure Systolic 0.0043 0.1503*
 Blood Pressure Diastolic 0.0047 0.0008
 Peak Expiratory Flow Rate 0.4164* 0.1987*

? P-values are calculated by applying two sample t-test with unequal variances * indicate insignificant values and ** indicate insignificant but on boundary.

5. Conclusion

It is very clear from the present study that weightlifting and or practicing weight training brings remarkable changes in the physiological parameters such as grip strength(P-value < 0.05 except grip strength for left horizontal), blood pressure(P-value = 0.004 < 0.005), and fitness score (P-value < 0.05). The blood pressure changes for junior weightlifters i.e., beginners are significantly more than senior novice weightlifters. Measurements on grip strength also indicate that there are adaptations due to weight training. The fitness score of weightlifters are of high 7 average category, which indicates that weightlifting enhances cardiovascular efficiency.

ACKNOWLEDGEMENT

The authors would like to thank the sportsmen and their Coaches from study area for= support and help during sampling and data collection.

.REFERENCES

Astrand P. O. and Rodahl K. (1986): Textbook of Work Physiology: Physiological Bases of Exercise; 3rd ed.; McGraw-Hill Book Co.; Singapore.
 Chiu Loren Z.F. and Schilling Brian K. (2005): A Primer on Weightlifting: From Sport to Sports Training; National Strength and Conditioning Association; Volume 27(1) pp 42–48
 Devi Sarojini H. (2006): Variations in Physical Structures of the Meitei Women Weight Lifters and the Controlled Group, Anthropologist, 8(4): 227-230.
 Ford et al. (2000): Gender and Height related limits of muscle strength in world Weightlifting Champions; Journal Applied Physiology; 89(3); pp-1061-1064.
 Gopal K. Kanji (2006): 100 Statistical Tests, 3rd ed. Sage Pub. New Delhi.
 Huy Quoc Phun(2006): Blood Pressure Changes during Weightlifting; a thesis submitted to the Yale school of Medicine for the degree of M.D.
 Newton, R.U., and E. Dugan (2002): Application of strength

diagnosis; Strength
Cond. J. 24(5):50–59. 2002.
Newton, R.U., and W.J. Kraemer(1994): Developing
explosive muscular power:
Implications for a mixed methods training strategy; Strength
Cond. J.;16(4):20–31.
Sodhi, H.S. and Sidhu, L.S.(1984): Physique and selection of
sportsmen; Punjab
publishing House, Patiala (1984).
Wilmore, Jack H. and David L. Costill(1999): Physiology of
Sport and Exercise. 2nd
ed.; Human Kinetics: Champaign, IL.
Zurairie M. et al (2009): Less fat, More fit; Thai Journal of
Physiological Sciences;
21(2)