Original Research Paper

EFFECTS OF 12 WEEKS EQUAL-VOLUME RESISTANCE TRAINING WITH DIFFERENT WORKOUT FREQUENCY ON TESTOSTERONE AMONG COLLEGE MEN STUDENTS

Dr. M. Elayaraja — Associate Professor, Dept. of Physical Education and Sports, Pondicherry University.

S.Kumaraguru — Ph.D. Scholar, Dept. of Physical Education and Sports, Pondicherry University.

ABSTRACT

The purpose of the study was to find out the effects of 12 weeks equal-volume resistance training with different workout frequency on testosterone among college men students with the help of 45 men students and aged between 18-21 years. The selected subjects were divided into Group I (3days in a week), Group II (5days in a week) and control group. The group I and group II named as experimental groups underwent resistance training program for 12 weeks as well as control group did not underwent any specific training program. The dependent variable testosterone was measured with the help of blood test before and after the training period. The collected data was analyzed by using (ANCOVA) analysis of covariance. The findings of the present study have shown that the degree and concentration of testosterone were significantly improved in the experimental group than in the control group. However, there were less or no significant differences in testosterone levels between the 5days in a week resistance training and 3days in a week resistance training group after the 12 weeks of training.

KEYWORDS

Introduction

The National Strength and Conditioning Association assert that a large number of people in society are suffering from obesity and diabetes due to sedentary lifestyle. Human diseases namely coronary artery disease, cancer, hypertension and chronic low back pain are strongly associated with obesity and diabetes (Wilmore et al., 2008). Therefore, people are largely acquainted with personalized exercise programs to lead a healthy lifestyle (France, 2008). However, studies are very limited on hormonal response among the younger age group in sports and physical education. In this scenario, the present study attempts to examine the effects of 12 weeks equal-volume resistance training with different workout frequency on testosterone among college men students.

Resistance training is also known as strength training or weight training. It is the capacity to overcome resistance or to perform against resistance and it is a product of voluntary muscle contractions caused by the muscles, bones, joints, heart, circulatory system, metabolism and nervous system (Hooper & Perring, 1999). Specifically, resistance training is part and parcel of all motor components, skills and tactics. It enhances the performance of athletes in terms of muscular mass, strength, endurance and tone (Singh, 1991).

Hormone is defined as the chemical messenger of the human body that controls and coordinates the activities of the various parts of the body. It facilitates muscle development, growth, maturation and immune response irrespective of age. It is secreted by the endocrine glands in the human body and its substances regulate the functions of body cells, tissues, organs and systems (Hall, 2015). Further, hormones are not only produced from the pituitary, testes, ovaries, pancreas, thyroid and the adrenal cortex but also from the heart, kidney, liver and adipose tissue. However, there are differences that exist with regard to reproductive hormones like testosterone, estrogens and progesterone (Marín-García, 2011).

Testosterone is a steroid hormone produced in the Leydig cells of the testes that has anabolic effects on muscle tissue. Testicular secretion accounts for 95% of the circulating testosterone present in men. However, the majority of testosterone in the blood derives from metabolism of androstenedione. Due to the androgen anabolic activity within the muscle, it influences strength development and muscle hypertrophy (Kraemer et al., 2003). The quantity of testosterone secreted naturally varies depending on heredity among human beings. However, people with higher levels of testosterone are likely to become natural athletes, whereas people with lower levels of testosterone face challenges in gaining muscle and strength (Collins, 2002). Moreover, testosterone level naturally increases for the people those who are engaged in physical activity irrespective of age. In particular, people in sports and games have high levels of testosterone secretion naturally.

Objective of the study

The main objective of the study was to investigate the effects of 12 weeks equal-volume resistance training with different workout frequency on testosterone among college men students.

Methodology

The purpose of the study was to find out the effects of 12 weeks equal-volume resistance training with different workout frequency on testosterone among college men students. 45 men students were randomly selected and aged between 18-21 years. The selected subjects were divided into Group I (3days in a week), Group II (5days in a week) and control group. The group I and group II named as experimental group underwent training program for three days per week especially on Mondays-Wednesdays-Friday: Group II underwent resistance training for five days per week especially on Mondays-Tuesday-Thursday-Friday-Saturday for 12 weeks of resistance training as well as the control group did not underwent any training program. The training programme consists of whole body workout that trained the entire muscle group. The number of exercises, intensity, repetition, and set were manipulated every four weeks as the training progressed. The dependent variable testosterone was measured with the help of blood test before and after the training period. The collected data was analyzed by using (ANCOVA) analysis of covariance.

HYPOTHESES

It is hypothesis that there would be a significant difference among three days in week resistance training, five days in week resistance training and control groups on Testosterone.

Table I. Analysis of covariance for testosterone of the 3 days/week resistance training,5 days/week resistance training and control groups

	3 days /week RT group	5 days /week RT group	Control group	Source of variance	Sum of squares	df	Mean square	F ratio
Pre-test mean SD	374.77 134.85	373.71 115.11	378.79 138.77	B W	215.33 709704.68	2 42	107.661 6897.73	0.01

Post-test mean SD	407.28 139.54	408.72 120.80	381.65 139.46	B W	6961.85 74920 9.60	2 42	3480.92 17838.32	0.19
Adjusted post-mean	408.29	410.82	378.54	B W	9664.23 4530.73	2 41	4832.11 110.51	43.73 *

*Significant at 0.05 level.
The required table value at 0.05 level of significance for 2 & 42, 2 & 41 degrees of freedom is 3.22.

The above table shows that the pre-test means of the 3-day-a-week resistance training, 5-day-a-week resistance training and control groups are 374.77, 373.71, and 378.79, respectively. The obtained F ratio 0.05 is lesser than the required table value 3.22 for 2 & 42 degrees of freedom at 0.05 level of significance. This result shows that there is no significant change in testosterone between the control and experimental groups before the training program.

The post-test means of the 3-day-a-week resistance training, 5-day-a-week resistance training and control groups are 407.28, 408.72 and 381.65, respectively. The obtained F ratio 0.19 is lesser than the required table 3.22 for 2 & 42 degrees of freedom at 0.05 level of significance. This result reveals that there is no significant change between the experimental and control groups after the training program.

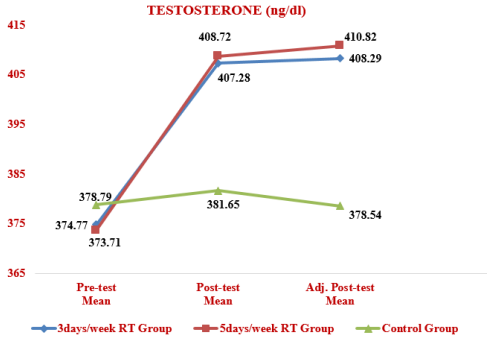
The adjusted post-test means of the 3-day-a-week resistance training, 5-day-a-week resistance training and control groups are 408.29, 410.82 and 378.54, respectively. The obtained F ratio 43.73 is greater than the required table value of 3.22 for 2 & 41 degrees of freedom at 0.05 level of significance. Therefore, there is a significant change in testosterone as a result of the training program.

Table II. Scheffe's post hoc test to measure ordered adjusted testosterone means between the experimental and control groups

3 days/week RT group	5 days/week RT group	Control group	Mean difference	CD
408.29	410.82		2.53	9.75
408.29		378.54	29.75	
	410.82	378.54	32.28	

The above table shows the Scheffe's post hoc test results for the two experimental groups: the 3-day-a-week resistance training group (adj. mean = 408.29) and the 5-day-a-week resistance training group (adj. mean = 410.82) had significant changes compared to the control group (adj. mean = 378.54) in testosterone with adjusted mean differences of 29.75 and 32.28 (CD = 9.75), respectively. However, there is no significant difference in testosterone between the 3-day-a-week resistance training group and the 5-day-a-week resistance training group with an adjusted mean difference of 2.53 (CD = 9.75).

Line diagram I. showing the mean values of testosterone of the 3 days/week resistance training, 5 days/week resistance training and control groups



DISCUSSION

The present study has shown that the degree and concentration of testosterone were significantly improved in the experimental group than in the control group. However, there were less or no significant differences in testosterone levels between the 5days in a week resistance training and 3days in a week resistance training group after the 12 weeks of training. This study reveals that the testosterone levels have a slight positive change in the experimental groups due to the vital factors of strength development and muscle hypertrophy. Moreover, testosterone response is necessarily dependent upon the frequency, volume and duration of training received. Resistance training increases the muscular strength through increased protein synthesis, functional adaptation, neuromuscular adaptation, increased dilation of blood vessels, lactate accumulation, blood flow in the testes and LH production. Elevated levels of testosterone have a direct stimulatory role in the above functions. In addition, the findings are observed while performing large muscle group exercises through dead lift, leg press and bench press with moderate to high frequency of exercises involving multiple sets. The results in the performance of resistance training are associated with the increased anabolic process. The above finding is substantiated by earlier findings (Taipale et al., 2014; Shakeri et al., 2012; Krüger et al., 2011; Ahtiainen et al., 2003; Volek et al., 1997; Mulligan et al., 1996; Potteiger et al., 1995; Craig et al., 1989).

REFERENCES

1. Ahtiainen, J. P., Pakarinen, A., Alen, M., Kraemer, W. J., & Häkkinen, K. (2003). Muscle hypertrophy, hormonal adaptations and strength development during strength training in strength-trained and untrained men. European Journal of Applied Physiology, 89(6), 555–563.
2. Craig, B. W., Brown, R., & Everhart, J. (1989). Effects of progressive resistance training on growth hormone and testosterone levels in young and elderly subjects. Mechanisms of Ageing and Development, 49(2), 159–169.
3. France, R. C. (2009). Introduction to physical education and sport science. USA: Cenage Learning..
4. Hooper, A., & Perring, M. (1999). Get fit, feel fantastic. Reader's Digest Association, p. 29.
5. Krüger, K., Agnischock, S., Lechtermann, A., Tiwari, S., Mishra, M., Pilat, C., ... & Mooren, F. C. (2011). Intensive resistance exercise induces lymphocyte apoptosis via cortisol and glucocorticoid receptor-dependent pathways. Journal of Applied Physiology, 110(5), 1226–1232.
6. Mulligan, S. E., Fleck, S. J., Gordon, S. E., Koziris, L. P., Triplett-McBride, N. T., & Kraemer, W. J. (1996). Influence of resistance exercise volume on serum growth hormone and cortisol concentrations in women. The Journal of Strength & Conditioning Research, 10(4), 256–262.
7. Potteiger, J. A., Judge, L. W., Cerny, J. A., & Potteiger, V. M. (1995). Effects of altering training volume and intensity on body mass, performance, and hormonal concentrations in weight-event athletes. The Journal of Strength & Conditioning Research, 9(1), 55–58.
8. Shakeri, N., Nikbakht, H., Azarbayjani, M. A., & Amirtash, A. M. (2012). The effect of different types of exercise on the testosterone/cortisol ratio in untrained young males. Annals of Biological Research, 3(3), 1452–1460.
9. Taipale, R. S., Mikkola, J., Salo, T., Hokka, L., Vesterinen, V., Kraemer, W. J., ... & Häkkinen, K. (2014). Mixed maximal and explosive strength training in recreational endurance runners. The Journal of Strength & Conditioning Research, 28(3), 689–699.
10. Volek, J. S., Kraemer, W. J., Bush, J. A., Incledon, T., & Boetes, M. (1997). Testosterone and cortisol in relationship to dietary nutrients and resistance exercise. Journal of Applied Physiology, 82(1), 49–54.
11. Wilmore, J. H., Costill, D. L., Kenney, W. L. (2008). Physiology of sport and exercise (5th edn). Champaign, IL: Human Kinetics.