Available online at www.pelagiaresearchlibrary.com

Pelagia Research Library

European Journal of Experimental Biology, 2012, 2 (4):1109-1112

ISSN: 2248 –9215
CODEN (USA): EJEBAU

The effect of weight Training in morning and evening on testosterone and cortisol in bodybuilders

[1]Seyedmostafa Tayebisani, [2]Pejhman Fooladi, [3]Farnaz Alikhani, [4]Sedigheh Aghayan and [5]Hassan Gharayagh Zandi

[1]Department of Physical Education, Shahrood Branch, Islamic Azad University, Shahrood, Iran
[2]Department of Physical Education, khorasgan Branch, Islamic Azad University, khorasgan, Iran
[3]Department of Physical Education, karaj Branch, Islamic Azad University, karaj, Iran
[1]Department of Physical Education, Dameghan Branch, Islamic Azad University, Dameghan, Iran
[4]Department of Physical Education, Tehran University, Tehran, Iran

---

ABSTRACT

The purpose of this study was to examine the effect comparison of weight Training at morning and evening shifts on Testosterone and cortisol in bodybuilders. 30 male students from Shahrood, Branch, Islamic Azad University were voluntary selected and randomly divided into the two groups; morning-time training group (N=15, weight = 74±2.69 kg, age = 22±2.18 years, length =172±3.37 training time = 10 am.) and evening-time training group (N=15, weight =77±4.15 kg, age = 21 ± 3.97 years, height =174±4.75 training time = 4 pm.). Both groups (Morning and afternoon) were performed resistance training program 3 days in week (12 weeks/36 sessions) with 50 to 80 % maximum power. Data was tested using dependent t test for comparison of data between pre- and post-test in per groups. Statistical significance was set at p<0.05. Also from the One Way ANOVA used for mean different comparing between post test in groups, and Tokay test for comparing between pre and post test mean different in per groups. The results showed there were significant differences between the amounts of testosterone (0.04) and cortisol (0.01) hormones secreted of both groups in pre-test and post-test. The findings of this research indicate that testosterone and cortisol hormones are influenced by the time of training which is due to circadian rhythm.

Keywords: Testosterone, cortisol, bodybuilders

INTRODUCTION

Diurnal variation of sports performance usually peaks in the late afternoon, coinciding with increased body temperature. This circadian pattern of performance may be explained by the effect of increased core temperature on peripheral mechanisms, as neural drive does not appear to exhibit nycthemeral variation. This typical diurnal regularity has been reported in a variety of physical activities spanning the energy systems, from Adenosine triphosphate-phosphocreatine (ATP-PC) to anaerobic and aerobic metabolism, and is evident across all muscle contractions (eccentric, isometric, concentric) in a large number of muscle groups. Increased nerve conduction velocity, joint suppleness, increased muscular blood flow, improvements of glycogenolysis and glycolysis, increased environmental temperature, and preferential meteorological conditions may all contribute to diurnal variation in physical performance. However, the diurnal variation in strength performance can be blunted by a repeated-morning resistance training protocol. Optimal adaptations to resistance training (muscle hypertrophy and strength increases) also seem to occur in the late afternoon, which is interesting, since cortisol and, particularly, testosterone (T) concentrations are higher in the morning. T has repeatedly been linked with resistance training adaptation, and higher concentrations appear preferential. This has been determined by suppression of endogenous production and exogenous supplementation. However, the cortisol (C)/T ratio may indicate the catabolic/anabolic environment of an organism due to their roles in protein degradation and protein synthesis, respectively. The morning elevated T level (seen as beneficial to achieve muscle hypertrophy) may be counteracted by the morning elevated C level and, therefore, protein degradation. Although T levels are higher in the morning, an increased resistance exercise–induced T response has been found in the late afternoon, suggesting greater responsiveness of the hypothalamo-pituitary-testicular axis then. Individual responsiveness has also been observed, with some participants experiencing greater hypertrophy and strength increases in response to strength protocols, whereas others respond preferentially to power, hypertrophy, or strength endurance protocols dependent on which protocol elicited the greatest T response. It appears that physical performance is dependent on a number of endogenous time-dependent factors, which may be masked or confounded by exogenous circadian factors. Strength performance without time-of-day–specific training seems to elicit the typical diurnal pattern, as does resistance training adaptations. The implications for this are (a) athletes are advised to coincide training times with performance times, and (b) individuals may experience greater hypertrophy and strength gains when resistance training protocols are designed dependent on individual T response [1].Biological rhythms represent ubiquitous regulation mechanisms found in most organisms, including plants, animals, fungi and cyanobacteria [2]. As defined by Haus and Touitou (1994), a biological rhythm is a regularly recurring component in a series of measurements of a biologic variable obtained as a function of time [3]. In human, a vast majority of physiological, biochemical and behavioural processes exhibit daily fluctuations. The simplest explanation of this phenomenon would be that these daily fluctuations may merely reflect different patterns of behavior imposed by the cyclical environment, e.g. sunlight-related night sleep versus diurnal (daylight-related) activity patterns resuling in differential metabolic demands. However, it has been repeatedly shown that when humans or experimentral animals are held in isolation without processes do not become disorganized. Actually, they continue oscillating, with a period of slightly different from that of 24 hours. For instance, periods for body temperature, plasma melatonin and cortisol have been reported to be very similar in duration of 24 hours and 11 minutes on average when measured under an artificial 28-hour day [4]. The meaning of this result could be explained (again) by the example of serum cortisol. As mentioned above, after several days living under and artificial day-length of 28 hours, daily rhythm of serum cortisol does not reset to a new 28 hours day but begins to oscillate with an approximate 24 h and 11 min period. This clearly implies that daily rhythm of cortisol has an endogenous origin with an intrinsic period being slightly longer than 24 hours. Therefore, a term circadian (from the latin circa diem = about a day), introduced by Franz Halberg, is widely used to describe daily rhythms of the acknowledged endogenous origin with a period close to 24 hours (e.g circadian rhytm of core body temperature, melatonin and testosterone [5, 6]. Both Serum cortisol and testosterone display a circadian pattern with early morning peaks and evening nadirs [7, 8]. Both testosterone (T) and cortisol (C) exhibit circadian rhythmical being highest in the morning and lowest in the evening. T is a potent stimulator of protein synthesis and may possess anti-catabolic properties within skeletal muscle, and C affects protein turnover, thereby altering the balance between hormone-mediated anabolic and catabolic activity. Physiological reactions of these hormones and training adaptations may influence the post-exercise recovery phase by modulating anabolic and catabolic processes, therefore affecting metabolic equilibrium, and may lead to intensification of catabolic processes. We investigated the effect of the circadian system on the T and C response of weight-trained men to heavy resistance exercise [9]. The purpose of this study was to examine the effect comparison of weight Training at morning and evening shifts on Testosterone and cortisol in bodybuilders.

MATERIALS AND METHODS

30 male students from Shahrood, Branch, Islamic Azad University were voluntry selected and randomly divided into the two groups; morning-time training group (N=15, weight = 74±2.69 kg, age = 22±2.18 years, lemgth =172±3.37, training time = 10 am.) and evening-time training group (N=15, weight =77±4.15 kg, age = 21 ± 3.97 years, length =174±4.75, training time =4 pm.). Both groups (Morning and afternoon) were performed resistance training program 3 days in week (12 weeks/36 sessions) with 50 to 80 % maximum power. Data was tested using dependent t test for comparison of data between pre- and post-test in per groups. Statistical significance was set at $p<0.05$. Also

from the One Way ANOVA used for mean different comparing between post test in groups, and Tokay test for comparing between pre and post test mean different in per groups.

RESULTS AND DISCUSSION

The results showed there were significant differences between the amounts of testosterone and cortisol hormones secreted of both groups in pre-test and post-test. However, there were significant differences between the concentration of testosterone and cortisol hormones of the two groups in pre-test and post-test. More over the results also showed a concentration amounts of testosterone and cortisol in the morning were higher than evening.The descriptive characteristics of subjects mentioned in Table 1. Also mean and standard deviation is shown in table 2. Eventually the results of One Way ANOVA test about of the Testosterone and cortisol hormones are shown in Table3.

Table1. Descriptive characteristics of subjects

Index / Groups	Length	Weight	Age
Morning group	172±3.37	74±2.69	22±2.18
Evening group	174±4.75	77±4.15	21±3.97

Table2. Mean and standard deviation in groups

Groups / Variables	Morning group (pre test)	Morning group (post test)	evening group (pre test)	evening group (post test)
Testosterone	18.43 ±3.54	18.01 ±2.37	15.90 ±3.78	16.87 ±4.12
Cortisol	619.9 ±132.56	566.43 ±170.12	410.45 ±172.34	306.21 ±59.43

Table3. The results of One Way ANOVA test in Testosterone and cortisol variables

	F	P value
Testosterone	1.39	0.04
Cortisol	11.45	0.01

CONCLUSION

The purpose of this study was to examine the effect comparison of weight Training at morning and evening shifts on Testosterone and cortisol in bodybuilders. Lawrence (2010) represented that Optimal adaptations to resistance training (muscle hypertrophy and strength increases) also seem to occur in the late afternoon, which is interesting, since cortisol and, particularly, testosterone (T) concentrations are higher in the morning [1]. Veldhuis (1987) and Van (1996) were shown that Both Serum cortisol and testosterone display a circadian pattern with early morning peaks and evening nadirs [7, 8]. Bird (2004) reported that both testosterone (T) and cortisol (C) exhibit circadian rhythmical being highest in the morning and lowest in the evening. T is a potent stimulator of protein synthesis and may possess anti-catabolic properties within skeletal muscle, and C affects protein turnover, thereby altering the balance between hormone-mediated anabolic and catabolic activity. Physiological reactions of these hormones and training adaptations may influence the post-exercise recovery phase by modulating anabolic and catabolic processes, therefore affecting metabolic equilibrium, and may lead to intensification of catabolic processes. [9]. Researcher investigated time of day effects on the testosterone and cortisol of weight-trained men to exercise. Results of this study supports by many studies and researchers [1, 7, 8 and 9].

Acknowledgements
This study was carried out with the grant of Islamic Azad University, Shahrood Branch. The author expresses his gratitude of the research assistant of Islamic Azad University, Dr. Sahebali Manafi.

REFERENCES

[1] Lawrence D. Hayes, Gordon F. Bickerstaff, and Julien S. Baker, *Chronobiology journal*, Jun., **2010**, Vol. 27, No. 4 , Pages 675-705
[2] Milan Sedlik. *Chornobiology International*. **2007**, 24, 1159-1177.

[3] Haus E, Touitous S. Springer Verlarg, **1994**, Berlin: 730.
[4] Czeisler CA, Duffy JF, Shanahan TL, Brown EN, Mitchell JF, Rimmer DW, Ronda JM, Silva EJ, Allan JS, Emens JS, Dijk DJ, Kronauer RE, **1999**, *Science* 284: 2177-2188.
[5] Halberg F, Panofsky H, Mantis H Human Thermo-Variance Spectra. **1964**, *Ann N Y Acad Sci* 117: 254-274.
[6] dray F Reinberg A, Sebaoun J. C R Acad Sci Hebd Seances Acad Sci D, **1965**, 261: 573-576.
[7] Veldhuis JD, King JC, Urban RJ, Rogol AD, Evans WS, Kolp LA, Johnson ML. *J Clin Endocrinol Metab*, **1987**, 65: 929-941
[8] Van Cauter E, Leproult R, Kupfer DJ. *J Clin Endocrinol Metab*, **1996**, 81: 2468-2473.
[9] Bird SP, Tarpenning KM. *Chronobiol Int.* **2004** Jan; 21(1):131-46.