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INFLUENCE OF DIFFERENT WORKOUT FREQUENCY IN RESISTANCE TRAINING ON CORTISOL AMONG COLLEGE MEN STUDENTS

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ABSTRACT
The purpose of the study was to find out the influence of different workout frequency in resistance training on cortisol among college men students. 45 men students were chosen as respondents for the study and their age ranged between 18-21 years. The twelve week training program was conducted for the three groups: 3days in a week, 5days in a week named as experimental groups underwent resistance training program and control group was under observation. The cortisol was measured by collection of blood sample before and after the training period. The collected data was analyzed by using (ANCOVA) analysis of covariance. The outcomes of the present study revealed that the cortisol has slightly decreased in the experimental groups than in the control group. Moreover, there was no significant change between the 5days in a week resistance training and 3days in a week resistance training group after the 12 weeks of training.

Keywords: Resistance training, Frequency, Hormones and Cortisol.

INTRODUCTION
Resistance training is also known as strength training or weight training. It is the capacity to overcome resistance or to perform against resistance for enhancing individuals' physical fitness and conditioning athletes. Fitness refers to a state of well-being of the human body and the mind. It is acquired through performing day-to-day activities without fatigue. Physical activity involves bodily movements through skeletal muscles by exhaustion of energy and it produces health benefits. It includes in particular walking to work, gardening, household chores, dancing and washing (Brown et al., 2006). Physical activity and positive lifestyle habits yield enormous benefits for human beings and it has been proved by scholars in the field of physical education.
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.
Cortisol is a hormone secreted by the adrenal gland, under the control of adrenocorticotrophic hormone (ACTH) from the anterior pituitary, when a person is under stress. Cortisol has a catabolic effect that breaks the tissue down, which increases the protein breakdown in the muscle. The important function of cortisol is to enhance the glucose concentration in blood for the immediate source of energy to the muscle. Cortisol enhances the fuel levels by producing glucose during gluconeogenesis in the liver, improving the storage of glucose and preventing the initiation of insulin-like growth factor, and inhibiting glucose entry into the muscle (Levine & Luft, 2013). Further, cortisol has a catabolic activity and it breaks down tissue to reduce protein synthesis and facilitates protein-to-glucose conversion and it also prevents tissue growth. Nevertheless, physical activity paves the way for increased cortisol levels in the human body. Resistance

training facilitates change in cortisol level, and this result in physiological changes in the human body. The human body is capable of moderate to intense physical activity for stress and it releases cortisol in the training period (Fleck & Kraemer, 2014).

METHODOLOGY

The purpose of the study was to find out the influence of different workout frequency in resistance training on cortisol among college men students. 45 men students were chosen as respondents for the study and their age ranged between 18-21 years. The twelve week training program was conducted for the three groups: 3days in a week, 5days in a week named as experimental groups underwent resistance training program and control group was under observation. 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 cortisol was measured by collection of blood sample before and after the training period. The collected data was analysed by using (ANCOVA) analysis of covariance.

RESULTS

TABLE I
ANALYSIS OF COVARIANCE FOR CORTISOL OF THE 3 DAYS/WEEK RESISTANCE TRAINING, 5 DAYS/WEEK RESISTANCE TRAINING AND CONTROL GROUPS

	3days /week RT group	5days /week RT group	Control group	Source of Variance	Sum of Squares	df	Mean Square	F ratio
Pre-test mean	14.16	14.19	13.94	B	0.56	2	0.28	0.01
SD	5.38	4.23	4.68	W	964.27	42	22.96	
Post-test mean	10.65	10.64	13.63	B	88.92	2	44.46	3.13
SD	3.60	2.82	4.66	W	597.27	42	14.22	
Adjusted	10.61	10.57	13.75	B	99.89	2	49.95	52.79*
Post-Mean				W	38.79	41	0.95	

*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 14.16, 14.19 and 13.94, 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. As a result, there is no significant change in cortisol 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 10.65, 10.64 and 13.63, respectively. The obtained F ratio 3.13 is lesser than the required table value 3.22 for 2 & 42 degrees of freedom at 0.05 level of significance. The adjusted post-test means of the 3-day-a-week resistance training, 5-day-a-week resistance training and control groups are 10.61, 10.57 and 13.75, respectively. The obtained F ratio 52.79 is greater than the required table value of 3.22 for 2 & 41 degrees of freedom at 0.05 level of significance. Thus, there is a significant change in cortisol due to the training program.

TABLE 2
SCHEFFE'S POST HOC TEST TO MEASURE ORDERED ADJUSTED CORTISOL MEANS BETWEEN THE EXPERIMENTAL AND CONTROL GROUPS

3 days/week RT group	5 days/week RT group	Control group	Mean difference	CD
10.61	10.57		0.04	0.90
10.61		13.75	3.14	
	10.57	13.75	3.18	

*Significant at 0.05 level.

The above table shows the Scheffe's Post-Hoc test results for he two experimental groups: the 3-day-a-week resistance training group (adj.

mean = 10.61) and the 5-day-a-week resistance training group (adj. mean = 10.57) had significant acute changes in cortisol compared to the control group (adj. mean = 13.75) with adjusted mean differences of 3.14 and 3.18 (CD = 0.90), respectively. Nevertheless, there is no significant difference in cortisol between the 3-day-a-week resistance training group and the 5-day-a-week resistance training group with an adjusted mean difference of 0.04 (CD = 0.90).

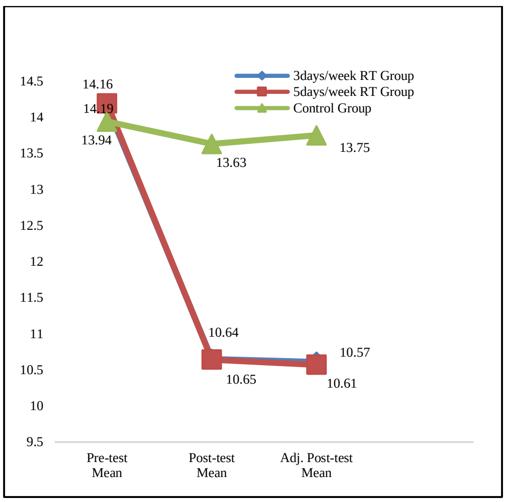

Figure 1: Line diagram showing the mean values of cortisol of the 3 days/week resistance training, 5 days/week resistance training and control groups

DISCUSSION

This study discloses that the cortisol decrease in the experimental groups compared to the control group is likely due to the changes in the level dependent on physical exercise including hypothalamus, pituitary and adrenal stimulation and ACTH secretion, temperature changes, hypoxia, stress, because of adrenal gland hypertrophy, increase in cellular structure that produces glucocorticoids, as a result of an increase in the adrenal cortex cells.

The study results also emphasize that the lack of changes in the cortisol level in resistance training is associated with the anabolic process. Changes in cortisol concentration during resistance training have been proposed as a means of strength performance of subjects, contributing to the anaerobic metabolism to energy supply, indicating that the anabolic process is necessary for the functioning of the glycolytic power system and performance. There was a slight reduction in cortisol concentration detected among the college men students.

The correlation between the testosterone and cortisol is considered to be a suitable biomarker for the relative anabolic and catabolic states. Normally resistance training produces muscular hypertrophy related to hormonal response. In this present study, hormonal variables such as testosterone and cortisol may indicate the anabolic (building of tissue) and catabolic (breaking down of tissue) activity, respectively. The mechanism for increased testosterone after resistance training is related to enhance pituitary response before the intense training, bringing about a positive influence on androgen anabolic activity during training, which is also typically characterized by the reduced levels of cortisol. Cortisol has an inverse relationship with all anabolic hormones, including testosterone, growth hormone and insulin. When cortisol is elevated, the other anabolic hormones are depressed, and vice versa. The findings of the present study have been substantiated by many other research groups working through different sets of activities and functions (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).

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