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THE EFFECTS OF THE RESISTANCE TRAININGS OF CONTINUOUS AND INTERMITTENT RESISTANCE TRAININGS ON IL-4 AND IFN-Γ OF YOUNG MEN

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ABSTRACT

The purpose of the present study was investigation of the effects of the two types of continuous and intermittent resistance trainings on relaxation levels of IL-4 and IFN-γ serums of young men, regarding to the shortage of studies about effects of various types of resistance trainings.

Twenty-one examined subjects of this research were divided to three groups of continuous resistance training, intermittent resistance training and control. The two exercises groups were participated in 8 weeks progressive resistance trainings. Blood samples were taken from the subjects, before (24 hr prior to the trainings beginning) and after (48 hr then the trainings ending) the trainings.

In order to investigate and compare variations of the variables, factorial analysis of variance with repeated measures was applied. IL-4 increased through resistance exercise (P=0.003), though there was no difference between the two training groups (P=0.53). In addition, IFN-γ decreased through resistance trainings, but there was not observed any significant difference between the two training groups (P=0.93).

Resistance trainings might probably cause activity enhancement of humoral immunity in young men, by increase in IL-4. This increment is independent from either continuous or intermittent type of resistance trainings. However, the issue should be surveyed in future studies, deeper.

Keywords: Humoral Immunity, Resistance Trainings, Cellular Immunity, Cytokines, Young Men

INTRODUCTION

Resistance trainings have been attended by many people of the society for the sake of improvement and maintenance of healthiness. In the other hand, the resistance trainings have various types that can have their common and individual unique influences on physiological systems of the body and specifically the immune system. Therefore, special attention to cytokines can be important, for clarifying complicated questions of immunity response to exercise. Immune system of the body associates in many activities such as inflammatory activities, allergy heightening and erasing pathogens (bacterial and viral) **[1,2].**

The inflammatory activity is based on production of cytokines like Interleukin-4 (IL-4) and Interferon-γ (IFN-γ). The produced cytokines of T-lymphocytes have remarkable part in development and enhancement of immune system performance against pathogens. Differentiation of T-lymphocytes to the type I indices (Th1/Tc1) are determined by IFN-γ production **[3].**

Outer membrane pathogens, which generate response of humoral immune system, would also lead to the differentiation of these cells to the type II indices (Th2/Tc2) and production of IL-4 **[4,5].** It has been shown in a study, 8 weeks resistance trainings would lead to decrease in IFN-γ levels **[6].** In contrast, some researchers have shown nonbeing increment and change of these indices, during and following trainings **[7].**

Nurtjahja-Tjendraputra et al (2007) reported 16 weeks resistance training would lead to decrease in concentrations of pre-inflammatory cytokines and increase in concentrations of anti-inflammatory cytokines **[8].** In overall, research results indicate that exercise and physical activity, and especially regular endurance trainings would affect various factors of the immune system. These influences are apparent about both performance improvement and the number of components of immune system **[2, 9,10].**

The purpose of the present study was comparison of the two types of continuous and intermittent resistance trainings on the levels of IL-4 and IFN-γ serums in young men, regarding to properties of cytokines and effects of resistance trainings.

SUBJECTS AND METHODS

Subjects

Twenty-one healthy 24 to 30 year old male students of Shiraz city of Iran were purposefully chosen and divided to three groups of continuous resistance training, intermittent resistance training and control (7

person for each group), randomly. The whole subjects owned perfect physical healthiness. Impressibility probability of dependent variable had been reduced by homogenizing the subjects, as much as possible. The properties of the subjects of the present research groups were presented in table 1.

Table 1: The subjects' properties

Variable	Continuous group	Intermittent group	Control group
Number	7	7	10
Age (Y.O.)	27.33±3.11	26.78±2.9	28.21±2.69
Height (cm)	178.31±4.55	178.63±5.21	179.34±6.83
Weight (kg)	76.46±5.76	75.86±5.94	77.25±6.53

Data Collecting Method

The subject became familiar with the trainings protocol in justification meeting, one week before the research execution. Beside of introducing resistance movements to the subjects, their properties and their 1RM for each movement were measured. The subjects held in the test session and the blood samples were taken from the three groups, 24 hours before trainings beginning. Thereafter, the subjects performed their trainings schedule progressively, in duration of 8 weeks. Relaxation blood samples were taken from the three groups again, 48 hours after the last exercise session.

Training Schedule

The resistance trainings schedule was held during 8 weeks (three weekly sessions, one day on-one day off), and each session was in span of 68 min and consisted of 10 min warm up, 52 main exercise and 6 min cold down. The subjects performed their trainings with 20, 25, 30, 35, 40, 45, 50 and 55 percentages of a maximum repetition for the first to the eighth weeks, respectively. Exercise load was the same for both continuous and intermittent trainings. The resistance trainings of each exercise group were designated in circular figure. Each circle involved chest press, legs press, biceps, triceps, forefeet, rear feet and lateral stretch (or length) that had the same execution order, as mentioned here. Spans of stations were considered as 3 min, which performed with different speeds in continuous and intermittent exercises. The rest intervals between each two successive stations and each two successive circles were considered as 1 min and 2 min, respectively. Two circles were considered for each exercise session. The continuous resistance training group performed each its 3 min station with speed of V (V was assigned as 75 BPM). The intermittent trainings group performed its station with span/speed of 10 sec/2V and 20 sec/0.5V, until compilation of the three min of the station training group

performed each of their stations with speed of V (V was assigned as 75 BPM). Since execution speed of each movement was controlled by metronome, movement number of each set was the same for the whole movements, and with increment in exercise intensity.

Blood Sampling and Cytokines Analysis

Blood sampling were taken from the middle vein (the basilic vein) of the subjects, in amounts of 5 cc. The gathered samples were poured over sterilized tubes, containing K3EDTR.The heparin tubes and EDTR were settled inside ice and then remained at the room temperature, for some minutes. Thereafter, serum separated from plasma, by means of centrifuge in span of 10 min and with revolution speed of 3500 RPM. The whole blood samples were pr in frozen state and at temperature of -20˚C, and were used at the time of lab examination. IL-6 of each sample was gauged by means of ELISA method utilizing eBioscience kit. CRP of each sample was done by method of Turbidimetric utilizing Cobas Integra 400 device at wavelength of 552 nm.

Statistical Method

At first, values of every under study variables were described by implementing mean and standard deviation, and Kolmogorov-Smirnov test was applied to examine data natural distribution and selection of either parametric or non-parametric test. It was clarified that the data had natural distribution. Factorial ANOVA with repeated measures in a scheme of 3×2 (three groups at two times) was used, to compare variations of under study variables, in the three groups of continuous, intermittent and control. Significance level was assigned as 0.05, for entire statistical tests. In addition, the statistical software SPSS ver.16 was utilized to carry out statistical calculations.

RESULTS

Statistical descriptions of IL-4 and IFN-γ have been presented in table 2. The values have been reported as mean and standard deviation. In order to compare variations of variables between the three groups, the results of factorial ANOVA with repeated measures have been shown in table 3. Significant differences were observed between the three groups, in variations patterns of IL-4 (P=0.003). In a manner that the IL-4 increased in the two training groups, in comparison to that and of the control group (P were 0.018 and 0.001 for continuous and intermittent trainings, respectively), though there was not observed any specific difference between the two training groups (P=0.53). There were significant differences in IFN-γ variations

pattern, between the three groups (P=0.006). In a manner that IFN-γ of the two trainings groups decreased significantly, comparing to that of the control group (P were 0.028 and 0.012 for continuous and intermittent groups, respectively), but the difference between the two training groups was not significant (P=0.93). Eventually, results of Toki post hoc have been presented in table 4.

Table 2: Statistical descriptions of the variables (mean ± standard deviation)

Variables	Sampling Times	Continuous Groups	Intermittent Groups	Control Groups
IL-4	Before Training	4.30 ± 0.88	4.34 ± 0.004	4.85 ± 1.37
	After Training	6.12 ± 0.76	7.01 ± 2.94	4.61 ± 1.93
IFN-γ	Before Training	17.97 ± 3.55	16.67 ± 2.19	15.81 ± 2.11
	After Training	13.95 ± 2.20	12.13 ± 1.14	15.95 ± 1.28

Table 3: Statistical results of factorial ANOVA with repeated measures to compare variations of the variables in the groups

Variables	Factor	F	P
IL-4	Time	19.18	0.001*
	Group	1.94	0.16
	Time*Group	7.07	0.003*
IFN-γ	Time	22.50	0.001*
	Group	3.30	0.052
	Time*Group	6.28	0.006*

**** The mean difference is significant at the 0.05 level***

Table 4: Results of Toki post-hoc to determine locations of significant differences

Variables	Pair to pair comparison	P-value
IL-4	Continuous Groups - Intermittent Groups	0.53
	Continuous Groups - Control Groups	0.018*
	Intermittent Groups - Control Groups	0.001*
IFN-γ	Continuous Groups - Intermittent Groups	0.93
	Continuous Groups - Control Groups	0.028*
	Intermittent Groups - Control Groups	0.012*

**** The mean difference is significant at the 0.05 level***

DISCUSSION

According to the results of the present study, IL-4 would heighten through resistance trainings. Though, there was no significant difference between continuous and intermittent resistance trainings, about this increment. In the other hand, IFN-γ decreased through resistance trainings, but there was no significant difference between continuous and intermittent resistance trainings, about that decrease. The literature has spare results about effects of resistance trainings on serum levels of inflammatory related cytokines, and no study could be found about the issue. Therefore, previous results about this matter are negligible, and no accurate conclusion can be drafted, before accomplishment of further studies. A

research has shown that eight weeks gradual resistance trainings relate to the decrease in levels of IFN-γ, during rest **[6].**

In contrast, some researchers indicated variation and increment of this index, during and following the exercise **[7].** Based on the results of Nurtjahja-Tjendraputra et al (2007) 16 weeks resistance trainings would lead to decrease in concentrations of pre-inflammatory cytokines and increase in concentrations of anti-inflammatory cytokines **[8].**

Cytokines different responses of various studies could be ascribe to physical situations of subjects, implementing different training schemes and methods (training protocol types), subjects training precedence, span and intensity of pressing stimulant, exercise habits and consistency to trainings. Physical activity has dual influences on the immune system, in such a way that long and intense periods of physical activities would lead to decrease in performance of the immune system and consequently might raise the probability of affliction with inflammation and infection **[11].** Indeed, the inflammations of various tissues are the immunity response to tissue wounds, which involves complicated reactions via immune cells and dissolved proteins, including cytokines, at location of inflammation **[12].**

Hence, oxidative damage and generated inflammation, following different training schemes, could expose performances of various systems of the body, such as the immune one, to variation that consequences to heighten inflammatory cytokines in serum and active muscles **[13].**

The tissue damages due to physical exercises would lead to intensify inflammatory cascades. Release of these cytokines would trigger inflammatory responses and stimulate release of IFN-γ, which exert its anti-inflammatory effect through secretion enhancement of IL-10 and IL-2 **[14].** Exercise would cause decreases in levels of inflammatory cytokines **[15,16,17].** IFN-γ production is vital for the sake of anti-viral defense, and several studies reported reduction of the concentration of IFN-γ, in tumors **[18,19].** Researchers believe that suppression of IFN-γ production is a serious mechanism for increment of infection risk in tumors **[18].**

The immune system of the body associates in many activities such as inflammatory ones, allergy raising and erasing pathogens (bacterial and viral) **[1,2].** The inflammatory activity is based on production of cytokines like IL-4, IFN-γ and variation of ratio of CD4 to CD8 lymphocyte cells. It is believed that production amount of lymphocyte cells and

in addition regulation of CD4 to CD8 ratio are dependent to existence of appropriate signals such as IFN- γ. The relative increment in IFN-γ, which is the activator of cellar immunity (production enhancements of Tc1 and Th1), and production reduction of IL-4, which is the activator of inflammatory and humoral immunity (production decreases in Tc2 and Th2), would lead to increase in activity of cellar immunity and affect on this ratio **[5].**

Nevertheless, the results about the two types of continuous and intermittent resistance trainings are not voluminous, and accordingly interpretation of the results should be performed, cautiously. However, it has been clarified in the present study that significant increment of IL-4 occurred through resistance trainings and significant decreases in IFN-γ happened through those types of trainings. Those variations were dependent from whether type of resistance trainings (neither continuous nor intermittent).

CONCLUSION

According to the results of the present study, it has been concluded that the resistance trainings would lead to activity enhancement of humoral immunity in young men, regardless of type of trainings (either continuous (moderate intensity) or intermittent (low and high intensity)). However, further studies are required, yet.

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