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The effect of eight week continuous and intermittent resistance training on proteinuria in active young men

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Abstract

The purpose of the present study was comparison of acute and chronic effects of the two types of continuous and intermittent resistance trainings on relaxation and in response to sport proteinuria, in active young men. Thereby, 21 males of this research were randomly divided to three continuous training, intermittent training and control groups. The two training groups participated in 8 weeks progressive trainings. Before, immediately then and 1 hr after first test (48 hrs before trainings beginning) and final one (48 hrs after trainings ending), urinary samples were taken from the subjects. Variance analysis test with repeated measurements was used, to investigate variations of the under study variables in both continuous and intermittent training groups. Results indicated that the 8 weeks resistance trainings (both continuous and intermittent) would cause increases in both glomerular and tubular proteinuria, in active young men. In the other hand, there wasn't observed any significant difference in increments of urinary proteins excretions, comparing between the continuous and intermittent resistance trainings. Though, urinary protein to creatinine didn't show any significant change of relaxation and in response to sport values, in both continuous and intermittent groups, after 8 weeks trainings. It appears, although resistance trainings, either continuous or intermittent type, would cause increments of pressure on kidneys and urinary excretions of proteins, but their thereafter proteinuria probably couldn't be a limiting factor of the activity and it's different from the pathologic conditions. However, annual physical examinations are necessary.

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Introduction

Attention to sport and physical activities has been turned to an unavoidable event. This attention exists in the whole levels of the society and with various aims. Physical activities and sport accompany with physiologic consistencies. The resistance trainings are noticed by many people, especially men, with the purposes of healthiness. Measurement of physiologic indices, following various training schedules, could aid better understanding of acute and chronic effects of resistance trainings. There're few researches about investigation of physiologic responses and consistencies, after execution of various resistance trainings, especially the continuous and intermittent ones. Investigation of these responses and consistencies, following various resistance trainings, would cause increment of coaches' knowledge in usage of suitable kind of resistance training, to accompany with further desirable physiologic consistencies.

Exercise can induce temporary proteinuria (18–100%), which usually resolve within 24-48 hrs (Gilli *et al.*, 1984). Proteinuria is mainly influenced by exercise intensity rather than duration (Bellinghieri *et al.*, 2008; Afshar *et al.*, 2008). Post-exercise proteinuria is a well-known phenomenon in both animals and humans (Gunduz and Senturk, 2003; Poortmans, 1985; Poortmans, 1988; Poortmans and Vanderstraeten, 1994). Large proteins, such as Globulin and Albumin cannot pass through Glomerular membrane and therefore, are observed in very small amounts in urine, but in case of Glomerular damages their amounts in urine increase, a condition called Glomerular Proteinuria (Poortmans, and Ouchinsky, 2006). Proteins with lower molecular weights such as β-2 microglobulin, and lysosome easily pass through glomerule, but due to sufficient tubular reabsorption, these proteins are also found in very small amounts in urine (Poortmans, and Ouchinsky, 2006; Poortmans *et al.,* 1996). In medical conditions accompanied by tubular disorders the presence of these proteins increases, a condition called tubular Proteinuria. It is observed that the Proteinuria is increased following heavy physical activities (Kocer *et al.*, 2008). Renal disorders caused by sports activities first were reported in 1878, after observing the incidence of Proteinuria in soldiers, who had hard physical activities. Post-exercise Proteinuria is a well-recognized phenomenon in human athletes, the severity of which has depended on the intensity of the exercise (Poortmans *et al.*, 1996; Poortmans, 1984). It has been suggested that the presence of excess protein excretion in urine may be due to a disturbance in the selective permeability in the glomerulus associated or not with a saturation process in the re-absorption of the filtered protein load (Poortmans *et al.*, 1996; Hardwicke *et al.*, 1970). These assumptions have been based on renal clearance of high and low molecular mass plasma proteins (Poortmans *et al.*, 1996). In renal disease in which glomerular permeability is increased, a larger excretion of proteins with high molecular mass has been observed (Poortmans *et al.*, 1996). It has been reported that when proteinuria is a consequence of tubular dysfunction, the amount of protein filtered by the glomeruli remains stable and the proteins with low molecular mass appear in larger quantity due to their incomplete tubular re-absorption (Poortmans *et al.*, 1996; Peterson *et al.*, 1969). The proposed mechanism of exercise-induced proteinuria involves increased glomerular permeability and exceeding the maximum tubular re-absorption capacity (Poortmans, 1985; Poortmans, 1988). Renal blood flow and glomerular filtration rate decrease during exercise. The decrease in blood flow is more apparent, and the filtration fraction increases during exercise, which facilitates the passage of proteins into the ultra-filtrate (Poortmans, 1985; Poortmans, 1988). Also, the loss of fixed negative charge from the capillary wall of the glomerular tuft may be responsible for exercise-induced proteinuria (Poortmans, 1985; Zambraski *et al.*, 1981). Still another mechanism suggested for post-exercise proteinuria is the maximal tubular reabsorption capacity being exceeded during heavy exercise (Poortmans, 1985; Poortmans, 1988; Zambraski *et al.*, 1981; Poortmans *et al.*, 1997). Algea and Parish (1958) reported that most sportsmen attending either contact or noncontact sports activities are observed to have a variety of proteins in their urine. Glomerular type, and both Glomerular and Tubular types have been observed after moderate and heavy trainings respectively (Boileau *et al.*, 1980; Poortmans, 1985). Poortmans and Vancalck, (1978), reported excretion of proteins after short strenuous exercise. They reported increase in total protein and Albumin content as well as renal clearance increase after exercise. Carroll and Temte (2000) reported that Proteinuria is a common problem in adults attending sports activities. It was also reported that fever, high intensity physical or sports activities, body water loss, mental stress, and serious diseases are benign and indangerous factors that may cause Proteinuria. According to him Proteinuria may be categorized as Glomerular, Tubular, and overflow, of which Glomerular type is most pronounced.

The purpose of the present study was determining the effects of continuous and intermittent resistance trainings on amounts of urinary protein to creatinine ratio, creatinine, β-2 microglobulin, total protein and albumin, in active young men.

Material and methods

Subjects

Statistical society of this study consisted of the whole active male students of Shiraz city. Thirty 24-30 years old active male students of Shiraz city (Iran) announced their readiness to participate in the study, and were purposefully chosen as the subjects and were randomly divided to two experimental groups and one control team (10 persons in each group). Based on examination and approval of physician, all of the subjects had perfect physical healthiness. The researcher reduced probability of dependent variables' impressibility from disruptive variants, as possible, by homogenizing the subjects (except the hereditary matters).

The subjects' properties of the present study have been represented in table 1.

Data collecting method

One week before the research execution, the subjects were become familiar with the trainings protocol, in justification meeting. In addition of introduction of the subjects with resistance movements, their properties and a maximal repetition for each resistance movement were measured. Then, the subjects attended in the test session, 48 hrs before the trainings beginning, and urinary samples were taken from the training groups, immediately then and 1 hr after one continuous or intermittent activity session, and also were gathered from the control team, without any exercise. The first continuous or intermittent activity session was held with 20% of a maximal repetition. Thereafter, the subjects performed their training schedule in a progressive manner, during 8 weeks. They practiced 3 weekly sessions. Also, the implemented progressive overload was in a manner that the subjects carried out their trainings with 20%, 25%, 30%, 35%, 40%, 45%, 50% and 55% of a maximal repetition for the first to the eighth weeks, respectively. After ending of the 8 weeks trainings, and thereafter a proportional rest to the first samples collecting day and trainings beginning (48 hrs), the last activity session was held, just like the first day and with 20% intensity of a maximal repetition. Also, before, immediately then and 1 hr after this session, urinary samples were taken, and the without exercise control group gave its urinary samples, too.

Resistance trainings schedule

The resistance trainings schedule involved 8 weeks (3 weekly sessions), and span of each session was 68 min and contained 10 min warm up, 52 min main exercise and 6 min cold down. In this schedule, a percentage of a maximal repetition and execution speed were considered as intensity and mass of exercise. The exercise load was the same, in the resistance continuous and intermittent trainings. The resistance trainings were designed in circular figures and two schemes of continuous and intermittent. Each circle consisted of chest press, feet press, fore-arm, fore-feet, rear-arm, rear-feet and sidelong tension (or length), which the order of movements' executions was in the same manner. The span of each station considered as 3 min, which done with different speeds in the continuous and intermittent trainings. The relaxation intervals between each two stations and each two circles were considered as 1 min and 2 min, respectively. Two circles were considered in each exercise session. The continuous training group performed the 3 min of each station with speed of V (V was considered as 75 BPM). The intermittent training group carried out 10 sec and then 20 sec with speeds of $2V$ and $1/2\ V$, respectively, till finishing of the 3 min of each station. Because speeds of the movements were controlled by metronome, number of movements in each set was the same for the whole movements and with increment of exercise intensity.

Gathering and analysis of urinary samples

The urinary samples were gathered in especial containers, before, immediately then and 1 hr after the first test (48 before trainings beginning) and the final one (48 hr after trainings ending). The control group gave urinary samples at the beginning and ending of the 8 weeks period (in company with the two experimental groups), and its members avoided any physical activity and were doing their usual and ordinary activities. It should be mentioned, in order to compensate lost liquid of the body, adequate drinks were prepared for the participants, after each activity session. All of urinary samples preserved in frozen from and at temperature of -20°C, till were used at laboratory examination time. It should be noticed, the participants were demanded to avoid using cigarette, alcohol and caffeine, at the nights before samples collecting and generally in entire stages of the research. The whole steps of samples collecting were carried out in the same conditions, for each of the participants. Also, each participant started and finished his entire activity sessions at their particular times, which were the same for his entire training sessions. Urinary albumin was measured by method of Colorimetry with Bromocrosol Green, using Quick Chem. kit with normal limitation of 30-300 (mg/24h). Total urinary protein was gauged by Bradford method utilizing Bradford kit, with normal limitation of 0-8 (mg/dL). Urinary β-2 microglobulin was measured by ELISA kit using Diametra kit, with sensitivity of 0.1 (mg/dL) and normal limitation of <0.2 (mg/dL). Urinary creatinine was gauged by method of Colorimetry using Quick Chem. Kit with normal limitation of 800-2000 (mg/24h), for men. Urinary protein to creatinine ratio was calculated after total protein unit conversion to mg/24h utilizing equation of $300 \times mg/dL$ and division of obtained numbers to creatinine, based on mg/24h unit.

Statistical methods

At first, value of each under study variable was described by utilizing mean (average) and standard deviation. Initially, Smirnov-Kolmogorov test was applied, to investigate natural distribution and usage of parametric or non-parametric tests, in this research. Since, the data had natural distribution; analysis of variance with repeated measurements was used, to investigate variations of under study variables in both continuous and intermittent groups. Also, data sphericity was investigated, simultaneously with execution of variance analysis test, to implement Greenhouse-Giggs modification on relative degree of freedom, in necessary cases. And, in order to compare values of any sample collecting time concerned to each under study variable, between the two continuous and intermittent groups, independent one-way analysis of variance test was applied, at the step of before activity, considering the presence of the control group, and independent T test was utilized at the steps of immediately then and 1 hr after activity. Also, T paired test was implemented, to confide nonbeing change of under study variables in the control group. The level of significance considered as 0.05, for the whole statistical tests. SPSS v.16 statistical software was used for accomplishing statistical calculations.

Results

Statistical descriptions of urinary albumin, total protein, β-2 microglobulin, creatinine and protein to creatinine ratio values have been represented in table 2. The values have been reported in mean and standard deviation forms. Table 3 shows statistical results of independent one-way variance analysis test, which has been compared relaxation levels of the under study variables, before and after the trainings period, between the three groups. Table 4 indicates results of Toki post-hoc test, following the independent one-way analysis of variance. Table 5 presents results of independent T test that has been compared post activity values of under study variables, between the continuous and intermittent groups, , before and after the trainings period. Table 6 shows results of variance analysis test with repeated measurements, which has been investigated variations of under study variants, in the two training groups. Table 7 represents results of LSD post-hoc test, following variance analysis test with repeated measurements, to determine inner-group differences locations. Table 8 indicates results of dependent T test that has investigated changes of the control group, during 8 weeks.

Table 1. The subjects' properties.

Variable	Continuous group	Intermittent group	Control group
Number	7	7	7
Age (years old)	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

Table 2. Statistical description of proteinuria.

Variables	Sampling Times	Continuous Groups	Intermittent Groups	Control Groups
Albumin (mg/24h)	Pre	72.42±19.87	77.14±26.73	67.42±10.37
	Post 1	90.71±21.73	95.57±24.22	
	Post 2	113.71±24.68	119.43±41.09	
	Post 3	129.29±15.68	134.57±43.60	66.14±15.37
	Post 4	142.43±23.22	150.43±35.25	
	Post 5	174.43±22.57	174.29±39.39	
Total Protein (mg/dL)	Pre	1.22±0.25	1.25±0.38	1.36±0.34
	Post 1	1.66±0.33	1.64±0.61	
	Post 2	2.41±1.25	2.18±0.63	
	Post 3	2.47±0.97	2.32±0.70	1.32±0.39
	Post 4	2.90±1.39	2.52±0.71	
	Post 5	3.21±1.74	2.63±0.64	
β 2 microglobulin (mg/dL)	Pre	0.61±0.12	0.56±0.20	0.701±0.128
	Post 1	0.81±0.09	0.76±0.19	
	Post 2	1.15±0.30	0.91±0.21	
	Post 3	1.40±0.32	1.22±0.21	0.707±0.200
	Post 4	1.64±0.40	1.39±0.24	
	Post 5	1.81±0.30	1.50±0.25	
Creatinine (mg/24h)	Pre	897.14±53.89	930.71±48.94	945.57±61.17
	Post 1	994.71±59.58	1001.6±108.82	
	Post 2	1120.6±49.83	1121.4±97.54	
	Post 3	1189.3±38.88	1188.4±94.60	925.71±93.24
	Post 4	1275.1±61.95	1236.4±93.75	
	Post 5	1340±87.45	1293.1±98.16	
Protein to Creatinine Ratio (mg/24h)	Pre	0.408±0.067	0.407±0.136	0.431±0.103
	Post 1	0.501±0.097	0.496±0.203	
	Post 2	0.652±0.369	0.587±0.184	
	Post 3	0.623±0.250	0.588±0.181	0.433±0.133
	Post 4	0.675±0.291	0.612±0.178	
	Post 5	0.703±0.324	0.613±0.165	

There wasn't observed any significant difference in relaxation levels of urinary albumin, total protein, β-2 microglobulin and creatinine, before and after the eight weeks trainings ($P<0.05$), but this difference location wasn't between the two training groups ($P>0.05$). Indeed, relaxation levels of these proteins in both training groups were significantly further than those of the control group (P<0.05). Also, there wasn't observed any significant difference in relaxation values of urinary protein to creatinine ratio, before and after the 8 weeks trainings (P>0.05).

Also, there wasn't seen any significant difference in entire under study in response to sport variables, between the two training groups, both before and after the trainings period (P>0.05).

Table 3. Statistical results of independent one-way variance analysis test to compare relaxation levels of variables between the three groups.

Variables	Time of Sampling	F	P
Albumin	Before Training	0.407	0.67
	After Training	12.769	0.000 *
Total Protein	Before Training	0.318	0.73
	After Training	5.110	0.017 *
β 2 microglobulin	Before Training	1.323	0.29
	After Training	14.50	0.000 *
Creatinine	Before Training	1.429	0.26
	After Training	25.301	0.000 *
Protein to Creatinine Ratio	Before Training	0.118	0.89
	After Training	1.901	0.17

* The mean difference is significant at the 0.05 level.

The whole variables increased significantly, in the continuous resistance training group, during the research period (P<0.05). Urinary protein to creatinine increased insignificantly, in the intermittent resistance training group, though the other variables increased, significantly (P<0.05).

Table 4. Results of Toki post-hoc test following independent one-way analysis of variance to compare relaxation levels of variables between the three groups.

Variables	Inter-Group Comparison	P value
Albumin	Continuous - Intermittent	0.93
	Continuous – Control	0.002 *
	Intermittent – Control	0.001 *
Total Protein	Continuous - Intermittent	0.92
	Continuous – Control	0.02 *
	Intermittent – Control	0.04 *
β 2 microglobulin	Continuous - Intermittent	0.37
	Continuous – Control	0.000 *
	Intermittent – Control	0.003 *
Creatinine	Continuous - Intermittent	1
	Continuous – Control	0.000 *
	Intermittent – Control	0.000 *

* The mean difference is significant at the 0.05 level.

Discussion

According to founds of the present study, there wasn't observed any significant difference in pre and post activity amounts of urinary albumin, both before and after the eight weeks continuous/intermittent resistance trainings. Though, both two training groups showed greater albuminuria than the control one, after the 8 weeks. Also, albuminuria increased in both continuous and intermittent groups, during the research period. And, there wasn't observed any significant difference between pre and post activity amounts of urinary total protein, both before and after the eight weeks continuous/intermittent resistance trainings. But, the two training groups indicated greater total proteinuria than the control one, after the 8 weeks. Montelpare *et al.*, (2002) gave companies fourteen volunteer men, in a continuous/intermittent bicycling trainings protocol on ergometer. They concluded the intermittent trainings have a greater effect in comparison to the continuous one, on urinary total protein and albumin excretions. Also, Montelpare *et al.*, (2002) declared that lactate concentration and blood PH depend to variations of albumin clearance and urine total protein.

Table 5. Statistical results of independent T test to compare post activity values of variables between the two training groups.

Variables	Time of Training	Time of Exercise	T	P
Albumin	Before Training	Immediately After Exercise	0.39	0.70
		One Hours After Exercise	0.31	0.75
	After Training	Immediately After Exercise	0.50	0.62
		One Hours After Exercise	0.008	0.99
Total Protein	Before Training	Immediately After Exercise	0.08	0.93
		One Hours After Exercise	0.42	0.67
	After Training	Immediately After Exercise	0.65	0.52
		One Hours After Exercise	0.82	0.42
β 2 microglobulin	Before Training	Immediately After Exercise	0.54	0.59
		One Hours After Exercise	1.74	0.10
	After Training	Immediately After Exercise	1.39	0.19
		One Hours After Exercise	2.04	0.06
Creatinine	Before Training	Immediately After Exercise	0.14	0.88
		One Hours After Exercise	0.02	0.98
	After Training	Immediately After Exercise	0.91	0.38
		One Hours After Exercise	0.95	0.36
Protein to Creatinine Ratio	Before Training	Immediately After Exercise	0.06	0.94
		One Hours After Exercise	0.42	0.68
	After Training	Immediately After Exercise	0.48	0.63
		One Hours After Exercise	0.65	0.52

* The mean difference is significant at the 0.05 level.

In the study of Montelpare *et al.*, (2002), resting measures of blood pH and blood lactate were altered by the workload stress of both continuous and the intermittent work tests. This is consistent with the findings of Poortmans *et al.*, (1990) that separate exhaustive rowing and bicycle ergometer tests caused post-exercise increases in blood lactate. Other studies also reported post-exercise concentrations of blood pH and blood lactate different from resting levels in work tests that used various work intensities(Poortmans, 1984; Poortmans and Labilloy, 1988).

Table 6. Statistical results of variance analysis test with repeated measurements to investigate changes of variants in the two training groups.

Group	Variables	F	P
Continuous Groups	Albumin	32.96	0.000 *
	Total Protein	7.83	0.023 *
	β 2 microglobulin	59.30	0.000 *
	Creatinine	63.92	0.000 *
	Protein to Creatinine Ratio	3.97	0.076
Intermittent Groups	Albumin	53.33	0.000 *
	Total Protein	21.04	0.000 *
	β 2 microglobulin	91.53	0.000 *
	Creatinine	116.23	0.000 *
	Protein to Creatinine Ratio	7.17	0.011 *

* The mean difference is significant at the 0.05 level.

Further investigations with control of other probable influencing variables, are necessary. Though, in the present study, lack of significant difference between albuminuria amounts of the three groups, before the trainings period, became to significant greater albuminuria in the two training group, in comparison to that of the control one, after the trainings period. The recent issue shows significant influence of training on albuminuria. However, there wasn't observed any significant difference between the continuous and intermittent resistance trainings (with the same masses and intensities). Despite the lack of significant difference between the two training groups, they revealed significant greater proteinuria than that of the control group. Hence, the type of the training probably doesn't have much effect on glomerular proteinuria, especially whenever the main kind of the training is a particular kind (like the resistance kind). Perhaps, intensity and duration of exercise are more important factors for influencing on urinary protein excretion. As seen in the present research, there might not be observed any significant difference between two various types of trainings, when they would be executed with the same intensities and durations.

Table 7. Statistical results of LSD post-hoc test concern to the observed significant difference in both training groups form variance analysis test with repeated measurements.

	Albumin		Total Protein		β 2 microglobulin		Creatinine		Protein to Creatinine Ratio
	Continuous Groups	Intermittent Groups	Continuous Groups	Intermittent Groups	Continuous Groups	Intermittent Groups	Continuous Groups	Intermittent Groups	Intermittent Groups
Pre-Post 1	0.001*	0.019*	0.024*	0.043*	0.001*	0.000*	0.000*	0.062	0.090
Pre-Post 2	0.000*	0.008*	0.035*	0.003*	0.002*	0.001*	.000*	0.000*	0.009*
Pre-Post 3	0.000*	0.001*	0.010*	0.006*	0.000*	0.000*	0.000*	0.000*	0.024*
Pre-Post 4	0.000*	0.000*	0.014*	0.003*	0.000*	0.000*	0.000*	0.000*	0.016*
Pre-Post 5	0.000*	0.000*	0.020*	0.001*	0.000*	0.000*	0.000*	0.000*	0.016*
Post 1-Post 2	0.000*	0.019*	0.12	0.002*	0.006*	0.024*	0.001*	0.001*	0.030*
Post 1-Post 3	0.006*	0.004*	0.042*	0.010*	0.001*	0.000*	0.000*	0.000*	0.129
Post 1-Post 4	0.006*	0.000*	0.044*	0.003*	0.001*	0.000*	0.000*	0.000*	0.068
Post 1-Post 5	0.001*	0.000*	0.050*	0.001*	0.000*	0.000*	0.000*	0.000*	0.079
Post 2-Post 3	0.118	0.026*	0.64	0.22	0.000*	0.000*	0.001*	0.000*	0.097
Post 2-Post 4	0.062	0.000*	0.005*	0.01*	0.001*	0.000*	0.002*	0.000*	0.37
Post 2-Post 5	0.002*	0.000*	0.023*	0.006*	0.000*	0.000*	0.002*	0.000*	0.43
Post 3-Post 4	0.091	0.035*	0.62	0.000*	0.012*	0.015*	0.008*	0.000*	0.006*
Post 3-Post 5	0.000*	0.000*	0.069	0.02*	0.000*	0.001*	0.004*	0.000*	0.31
Post 4-Post 5	0.003*	0.000*	0.138	0.27	0.024*	0.10	0.008*	0.001*	0.95

* The mean difference is significant at the 0.05 level.

Poortmans and Labilloy (1988) reported that the post-exercise Proteinuria is more related to activity intensity. Poortmans and Vancalck (1978) showed that intense activity result in urinal excretion of albumin and total protein. Kramer *et al.*, (1988) reported that Albuminuria increases following heavy sports activities. This indicates Glomerular origin of Proteinuria (Poortmans and Vancalck, 1978). Delforge *et al.*, (1969) also showed that the more the exercise intensity the more serious is Proteinuria. This conclusion was then confirmed by Kachadorian and Johnson (1970) and Todorovic *et al.*, (1972). Some of the researcher have shown following light physical activities Proteinuria is observed to increase only in some unhealthy, for example diabetic, sedentary people, and this is not the case for healthy ones (Poortmans and Labilloy, 1988). Vanleubo (1878), Poortmans and Vancalck (1978), Depaolo *et al.*, (2002), and Turgut *et al.*, (2003) showed that urinary excretion of proteins increases following physical activities, and this may be related to renal clearance increase (Poortmans and Vancalck, 1978).

Also, based on understandings of the present study, there wasn't observed any significant difference in pre and post activity amounts of urinary β-2 microglobulin, both before and after the eight weeks continuous/intermittent trainings. Though, the two training groups showed greater β-2 microglobulinuria than that of the control one, after the 8 weeks. Also, β-2 microglobulinuria significantly increased in both continuous and intermittent resistance training groups, during the research period. The prominent influence of training on urinary β-2 microglobulin couldn't be neglected. Because, despite the lack of any significant difference in amounts of β-2 microglobulinuria before the eight weeks trainings, these amounts in the two training groups were significantly more than that of the control one, after the 8 weeks trainings, which denoted the effect of training on tubular proteinuria. As mentioned about glomerular proteinuria, the sameness of intensities and durations of trainings are probably the effective main parameters on the lack of significant difference in amounts of tubular proteinuria, between continuous and intermittent trainings, and when these two factors are constant, the kind of training might not has any significant influence. However, in order to state with strict confidence, further investigations are required.

Table 8. Statistical results of T test concern to variations of the control group, during 8 weeks.

Variables	t	P
Albumin	0.18	0.85
Total Protein	0.27	0.79
β 2 microglobulin	0.062	0.95
Creatinine	0.46	0.66
Protein to Creatinine Ratio	0.052	0.96

Previous studies indicated that tubular Proteinuria occurs with increasing physical activity intensity (Poortmans and Vancalck, 1978). Poortmans and Vancalck (1978), and Montelpare *et al.*, (2002) showed that periodic physical load increases β2-Microglobulinuria. After exercise high renal clearance of β2-Microglobulinuria has been observed. This indicates that post-exercise Proteinuria has also a tubular origin (Poortmans and Vancalck, 1978). Poortmans *et al.*, (1988) showed β2-Microglobuline along with increasing blood lactate. Perhaps several amino acids contribute to tubular reabsorption disorder (Alizadeh *et al., 2008*). Under rest conditions more than 95% of filtered proteins are reabsorbed by proximal tubular cell and converted to amino acids (Alizadeh *et al., 2008*). All amino acids are present in overflow Proteinuria, and tubular reabsorption is prevented as a result of absorption capacity completion (Alizadeh *et al., 2008*). Suzuki and Ikawa (1991) stated that decreasing blood PH as a result of organic acids may change Glomerular permeability and prevent tubular absorption. This may be one of the reasons of increasing Proteinuria as a result of heavy physical activities, because we know that heavy physical activities make body environment more acidic. These findings have been confirmed with Turgut *et al.*, (2003).

If blood PH was being investigated, this issue could be discussed with more certainty.

Turgut *et al.*, (2003) reported significant post exercise Proteinuria in both young men and women. The narrowing of renal arteries due to epinephrine. and norepinephrin increase during exercise may be one of the reasons of post-exercise Proteinuria increase (Poortmans, 1984). As a result of renal blood flow decrease during exercise Glomerular filtration rate also decreases and regarding that this decrease is smaller that renal blood flow decrease, the filtration fraction increases and as a result passing through Glomerular membrane becomes easier for high molecular weight proteins (Poortmans, 1984). Increase in plasma rennin activity, which is observed during hard physical activities and is a result of Glomerular sympathetic excitement may affect post-exercise Proteinuria (Poortmans, 1985; Creeth *et al.*, 1963). The mediation of Kallikrein, an enzyme of Kinin system, which is closely related to Renin-Angiotensin system, may increase the permeability of Glomerular membrane (Poortmans, 1985; Creeth *et al.*, 1963). The loss of capillary wall negative charge may also be effective. Zambraski *et al.*, (1981) studied variations of renal sialic acids in response to activity, and stated that training decreases Glomerular electrostatic resistance and may justify part of increase in passage of macromolecules. The role of factors like prostaglandins is also of importance, and if people take medicines that block prostaglandins production during exercise, Proteinuria decreases significantly, provided that there is no renal hemodynamic change (Feldt-Rasmussen *et al.*, 1985). Gundoz *et al.*, (2007), Senturk *et al.*, (2007), and Kocer *et al.*, (2008) observed increase in post-exercise Proteinuria. The findings of Poortmans and Vancalck (1978), and Clerico *et al.*, (1990) suggest that post-exercise Proteinuria is very transient. Although the main factor affecting post-exercise Proteinuria is activity intensity (Poortmans and Vancalck, 1978; Kramer *et al.*, 1988), the activity duration is also effective (Boileau *et al.*, 1980; Clerico *et al.,* 1990).

In order to achieve more accurate investigations, it's recommended to examine levels of katekolamin, renin, kallikrein and prostaglandin serums, in future researches, too. Also, consideration of investigating renal sialic acids, in company with urinary excretions of proteins, could be remarkable, and might lead to more exact conclusions.

There wasn't observed any significant difference between pre and post activity amounts of urinary creatinine, both before and after the eight weeks period, in the present study. Though, the two training groups showed greater creatinineuria than that of the control one, after the 8 weeks. Also, in this study, creatinineuria increased significantly in both continuous and intermittent resistance training groups, during the research period. And, based on the understandings of the present work, there wasn't observed ay significant difference between relaxation and after activity amounts of urinary protein to creatinine ratio, before and after the eight weeks continuous/intermittent trainings period. Even, the two training groups didn't indicate any significant difference in comparison to the control one. In this study, urinary protein to creatinine ratio increased in the two continuous and intermittent resistance training groups, but this increment was significant only in the intermittent one. Recognition of proteinuria quantity needs 24hr urine gathering. But, 24 hr urine gathering is often a difficult task and could accompany with some mistakes, too (Sandeep *et al.*, 2004).

Urinary protein to creatinine ratio has been recognized as a fast and reliable test for estimating abnormal ranges of proteinuria (Shastri *et al.*, 1994). The obtained results, which have been reported in protein to creatinine ratio quantities, are replacements instead of 24hr urine samples (Ginsberg *et al.*, 1983; Schwab *et al.*, 1987). Analysis of researches' results represented a significant correlation between protein to creatinine ratio of random urine sample and 24hr urine samples. Neithardt *et al.*, (2002), showed correlation coefficient of 0.93 between 24hr urinary protein excretion and protein to creatinine ratio. Also, Yamasmit *et al.*, (2003), reported correlation coefficient of 0.92 between the two mentioned variables. Robert *et al.*, (1997), present the correlation coefficient between protein to creatinine ratio and amount of 24hr protein excretion of urine, as 0.94, too. The recent issue indicates a strong link between protein to creatinine ratio of random urine sample and 24hr proteinuria (Robert *et al.*, 1997).

Therefore, protein to creatinine ratio of random urine sample could replace time consuming methods of urine protein gathering. In this study, this ratio has been used to examine 24hr urinary protein excretion. The ranges of less than 0.1, between 0.1 to 1 and more than 1 of protein to creatinine ratios, could represent physiologic, pathologic and nephrotic domains of proteinuria, respectively (Kristal *et al.*, 1988).

It has been concluded that the protein to creatinine ratio is more reliable and operational, to evaluate proteinuria quantity (Kristal *et al.*, 1988). Of course, weak correlation coefficient cases have been reported, too. However, possible reason of weak correlation of patients with renal failure could be decrease in glomerular filtration (Kristal *et al.*, 1988; Sandeep *et al.*, 2004). This coefficient depends on the amount of glomerular filtration, and it's independent from gender, age and weight (Kristal *et al.*, 1988; Sandeep *et al.*, 2004). Also, it's being declared that the ratio of less than 0.2 indicates a proteinuria with a normal range, and proteinuria of more than 3.5 represents nephrotic domain of proteinuria (Sandeep *et al.*, 2004). So, protein to creatinine ratio is used to recognize significance of proteinuria (Saikul *et al.*, 2006). In the present research, proteinuria was lower than nephrotic domain. Hence, although resistance trainings, whether the continuous or intermittent type, would cause increase in pressure on kidneys and increment of urinary protein excretion, but thereafter proteinuria couldn't limit the activity and is different from pathologic conditions.

Mousavi *et al.*, (2011) didn't observe any significant difference in proteinuria, between continuous and intermittent trainings. Of course, their using trainings included running continuous and intermittent trainings (not the resistance ones).

Their research was designated to compare effects of continuous and intermittent running on urinary excretion of protein from activity, in untrained 20-29 years old females, who didn't have any physical practice during previous three months from beginning of their work (Mousavi *et al.*, 2006). Their participants were randomly divided to three continuous training, intermittent training and control groups (15 persons in each group). Entire participants of their whole groups performed an exhaustive activity to maximum capacity, and in order to estimate hematuria and proteinuria, urinary samples were gathered, immediately then and 1 hr after their activities. Two days later, the training groups started their continuous and intermittent trainings schedules for 12 weeks (3 weekly sessions), separately (Mousavi *et al.*, 2006). Two days after last session, the whole participants of the three groups, carried out another exhaustive running session to maximum capacity, and urinary samples were gathered, again. Urinary protein evaluation following exhaustive sport was significant, in their whole groups, but the differences between pre and post-exercise amounts of two continuous and intermittent groups, and also between the three groups, weren't significant (Mousavi *et al.*, 2006). Further investigation should be accomplished to achieve more reliable results, and it seems a vast research field is provided. It's recommended, more subjects should be used in future researches. Also, it's still unknown that there might appear a significant difference in proteinuria of active young males, between the continuous and intermittent resistance trainings, when duration of trainings in the present study is longer.

Conclusion

According to the understandings of the present study, there doesn't seem a significant difference in proteinuria between the continuous and intermittent resistance trainings. So, it doesn't seem the type of the training has any significant influence on tubular and glomerular proteinuria, and perhaps intensity and duration of trainings are the determining factors. Because, researches' literature represents one in agreement understanding with the present study, which has denoted lack of significant difference between continuous and intermittent trainings, and one in contrary found to the present work, which has declared further effects of intermittent trainings than continuous ones, also considering this fact that the number of previous founds is few, further investigations should be carried out to earn an accurate conclusion and represent a clear statement, with confidence. However, proteinuria was lower than nephrotic domain, in the present study. Therefore, although resistance trainings, either continuous or intermittent type, would cause increases in pressure on kidneys and urinary protein excretion, but the thereafter proteinuria probably might not limit the activity and is different from pathologic conditions. However more studies are required.

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