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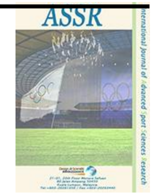

Effect of Additional Weights Training on Some Physiological and Biochemical Markers of Iraqi Women's Football Team

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ABSTRACT

This study was developed to find out the effect of additional weights training on some physiological and biochemical markers of Iraqi womens football team. A total of 22 women football players aged (30-35) year volunteered for the study, were divided (n=11) into two groups (intervention and control group). The training program included transition speed and jumping skills exercises with additional weight ranging from (8% to 11%), and were completed 10 week; 2 training units a week; 90m per unit. Selected physiological and biochemical markers were measured at 0.05 of significant level and at the end of pre and post training. Results of current study were a significant increase ($P<0.05$) in calcium, magnesium, ferrum, glucose, and phosphor in intervention group when compare to control group. However, no significant change was found in heart rate, high and low pressure after training program in two groups due to 10 week of the training is not enough to improve physiological variables. In conclusion current study would provide advantageous information for effect of additional weight training time on women football players in physiological and biochemical markers.

***Keywords*:** additional weights training; physiological and biochemical markers; women football.

1. Introduction

Women's football (Also known as Women's soccer) is the most prominent team sport played by women around the globe. It is played at the professional level in numerous countries throughout the world and 176 national teams participate internationally (Grainey., 2012). Football is undoubted the world's most common sport. A popular aspect of this sport is the need of teamwork to balance individual skills. In order to acclimate to technical evolution within the game, players must meet the physical demands. To achieve the best thinkable performance, training has to be formulated giving to the basics of periodization (Bompa, 1999). Furthermore, women growth and progress phase of life has influence on training (Noor, 2010).

The training made changes observed in numerous biochemical and physiological parameters can be attributed to appropriate load dynamics. Body women composition has an important role in playing football (Enemark *et al*., 2009). Since in football quite of physical contacts happen and many movements and skills are included a high level of physical demand is required which includes short sprinting, kicking, catching, trapping, throwing, etc (Noor., 2010). Since football players should be cover a big area in the land during attacks and defenses, the game demands for physiological as well as biochemical markers (Popadic *et al*., 2009). A high number of accelerations associated with a large number of changes in direction of play create an additional weight to the muscles involved. So, just those players who are suited to deal with these requirements, reach elite levels (Miller *et al*., 2007).

The intermittent high intensity design of movement through matches demands a high function of physiological and biochemical markers to increase energy delivery pathways (Venturelli., 2008). Moreover, transition speed and jumping skills have great impacts over the game which is required during sprinting and in execution of various skills with the ball (Noor., 2010). Oxygen is transported to muscles primarily by haemoglobin and the heart beats faster to supply the muscles with more oxygen-rich blood (Suhr *et al*., 2009). Physiological and biochemical markers are required within exercise (e.g heart rate, blood pressure, calcium, magnesium, ferrum, glucose, and phosphor), in order to provide energy and oxygen at the working muscle; so an optimum level of these markers is required in both women and men to perform at the highest level with high intensity.

As football performance rely mostly on these components of the athlete, players need to maintain normal these markers level to optimise their performance. Serum levels of blood are sometimes used for assessment of training-related stress (Urhausen and Kindermann., 2002). During football training, these parameters may be evaluated at regular intervals to assess the training load imposed on athletes. Regular monitoring of these health-related variables of women’s football players can provide valuable information about their fitness, metabolic and cardiovascular status. This study has been focused on women’s football players as this sport is the most popular one and played throughout the world.

Physiological and biochemical variables have important role for evaluation of training and assessment of health, metabolism and cardiovascular status of football players. Regular monitoring of physiological and biochemical variables during training with additional weight may provide valuable information to coaches for training. Studies on the physiological and biochemical markers of women’s football players particularly in relation to additional weight training are lacking in Iraq. In view of the above, this study was designed to investigate the effect of additional weights training on some physiological and biochemical markers of Iraqi women football team.

2. Methodology

Study used experimental style because it is suitable to nature of the research problem and the duration of study is ranged from 15/2/2013 to 5/4/2013. The study utilized a two groups design with random assignment. Baseline testing was conducted prior to training and included assessment of physiological aspects (e.g. heart rate and high and low blood pressure), and biochemical markers (e.g. calcium, magnesium, ferrum, glucose, and phosphor). Subjects followed the 10-week training, which was prescribed by researcher of the professional exercises to which the subjects were contracted. Subjects were retested post-tests (week 11) in a manner identical to baseline testing.

2.1 *Subjects*:

Twenty two (N=22) Iraqi women football players aged 30-35yer, habitually playing competitive football, volunteered for the present study. They were selected from the training sites at Sports Authority of Iraq. The players were equally divided (n=11) into two groups (intervention and control). Intervention group used training program with additional weight whereas control group used training program without additional weight. At baseline, no statistically significant differences were found in height, weight, and age as shown in table (1) or pubertal stage between the intervention and control groups. Further, no pre-training differences in football measures were present. Time of experience in the sport of football averaged 9.4 years over all included participants and did not differ significantly between samples of group. Participants were equal and no statistically significant differences in physiological and biochemical markers on pre-tests.

(Table 1)
Shows homogeneity of participants.

Variations	N	mean	median	Deviation	Skewness Coefficient
Height (cm)	33	155.79	155	3.059	0.667
Weight (Kg)	33	59.79	61	2.655	0.909 -
Age (month)	33	252.12	251	2.747	1.203

2.2 *Measurements*:

The selected physiological and biochemical markers were measured in the laboratory at the beginning of the training (baseline data) and at the end of training phase. Each test was scheduled at the same time of day (±1 hour) in order to minimize the effect of diurnal variation. All the experiments were performed at 25 ±1oC, with a relative humidity of 60- 65%. The subjects were informed about the possible complications of the study and gave their consent. The study was conducted at Sports Authority of Iraq and was approved by the Human Ethical Committee of the University of Baghdad.

2.2.1 *Measurement of Physiological Variables*

- Measurement of height and weight:

The height was measured by the stadiometer (Seca 220, UK) with an accuracy recorded to the nearest 0.5 centimeters (cm). The subject stood bare foot, and erect with heels together and arms hanging naturally by the sides. The heels, buttocks, upper part of the back and usually but not necessarily, the back of the head were in contact with the vertical wall. The subject looked straight ahead and took a deep breath during measurement. The distance from the standing platform, to the highest position of head (vertex) was measured. The weight was measured by medicine electronic scale (made in Japan). The participate stood on the scale without shoos and researchers recorded the weight number.

- Measurement of heart rate:

Researchers took player's heart rate by monitor; as explain bellow:
A heart rate monitor was used to get a more accurate heart rate measurement. This is particularly important during exercise where the motion of exercise often makes it hard to get a clear measurement using the manual method. Using a heart rate monitor is also useful when you wish to record heart rate changes over short time periods, where the heart rate may be changing. Many heart rate monitors are able to record the heart rate values to be reviewed later or downloaded to a computer figure (1) shows heart rate monitor. We can get full heart rate without account or multiplying numbers (wikipedia, 2009).

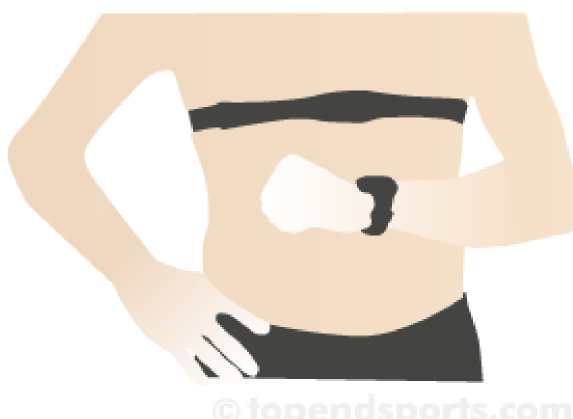

Figure 1. Shows heart rate monitor

- Measurement of high and low blood pressure:

Blood pressure monitor was used at current study as shown in figure (2). Monitoring blood pressure players by using a blood pressure monitor, it is a really useful way of evaluate a blood pressure and accurate readings and important technique.

Figure 2. Shows blood pressure monitor

2.2.2 *Measurement of biochemical markers*:

Five (5) ml of venous blood was drawn from an antecubital vein 24 hours after the last bout of exercise for determination of calcium, magnesium, ferrum, glucose, and phosphor to know the efficiency of working muscles.

2.3 *Pre-tests*:

Physiological indicators measurements and blood drawn were achieved by blood tests specialist. The location of tests at the sports Olympic Academy in Baghdad on the morning of Tuesday, 3 \ 1 \ 2012, results of tests were received on Sunday, 8 \ 1 \ 2012 as shown in table (3).

(Table 2)
Shows physiological and biochemical markers tests

N	Tests	Intervention group			Control group			T test	Significant
		N	Mean	Deviation	N	Mean	Deviation		
1	Heart rate	11	72.18	2.786	11	71.73	2.533	0.400	No
2	SYS pressure	11	120.23	5.880	11	119.73	4.860	0.219	No
3	DIA pressure	11	66.84	3.964	11	66.30	4.381	0.306	No
4	Calcium	11	10.13	2.935	11	9.91	2.663	0.183	No
5	Magnesium	11	6.02	1.267	11	5.91	1.578	0.185	No
6	Ferum	11	179.68	14.622	11	178.18	13.884	0.246	No
7	Phosphor	11	10.86	1.382	11	10.45	1.214	0.728	No
8	Glucose	11	193.41	21.925	11	203.00	32.212	0.816	No

Tabulate T = 2.086, Significant level (0.05), Freedom degree (20).

2.4 *Training program*:

After taking the baseline data the players went through a training program. The training session consisted of 10 weeks. The volume and intensities of the training components also varied to each group of the training. Intervention group used training program with additional weight whereas control group used normal training program, the volume and intensity of the training increased gradually. At the same time, a highly specified training related to football and practicing for matches was followed. Training program involved jumping and transition speed exercises with additional weight ringed from 8% to 11% of body weight as chest coat and 4% to 6% around legs and 3% to 5% around arms. The intensity of jumping skills ranged from (75% to 95%) with 4-6 exercises of 4 sets and rest 3-4m between exercise and other. On the other hand, intensity of speed strength training ranged (85% to 95%) with 2-6 exercises of 8 sets and rest 3-5m between exercise and else. The intensity was determined depend on additional weight. The players generally completed an average of one hour and 20m of training weekly which was mostly performed to improve the transition speed and jumping skills of the players. The training sessions were followed 2 days/week (Sunday and Wednesday), according to the requirements of the game demand. Training sessions started on January 9, 2012 to March 14, 2012.

2.5 *Post-tests*:

Physiological indicators measurements and blood drawn were achieved by blood tests specialist. The location of tests at the sports Olympic Academy in Baghdad on the morning of Thursday, 15 \ 3 \ 2012, results of tests were received on Sunday, 18 \ 3 \ 2012.

2.6 *Statistical analysis*:

All the values of biochemical and physiological markers were stated as Mean, Standard Deviation, Median, Skewness Coefficient, and Percentage. Analysis of (T test of different subjects and T test of connected subjects) was performed to find out the significant difference in selected physiological and biochemical markers among the groups. In each case the significance level was chosen at 0.05. SPSS software for Windows was used.

3. Results and Discussion

No significant increasing in the percent heart rate was reported among the women's football players of two groups when comparing pre-test with post-test. However, when comparing pre-test with post-test of experiment group, no significant change was noted in the percent heart rate (Table 3) and the same thing in control group (Table 4). On the other hand, no significant increase in blood pressure (SYS) was observed among the experiment and control group players. No significant difference in blood pressure (DIA) groups when comparing pre and post-tests. Furthermore, significant difference was observed in the calcium level among the players of experiment group after the training program, but no significance change was noted in the calcium level among control group.

A significant increasing (P<0.05) in magnesium was noted in two groups. In addition, a significant reduction was noted in ferum level among the football players of two groups after the training. A significant increasing (P<0.05) in phosphor level was noted among the players of experiment group players (Table 3). However, no significance difference in phosphor was noted in control group (Table 4). Glucose level increased significantly (P<0.05) among the two groups players.

(Table 3)
Shows physiological and biochemical markers tests of experiment group

N	Tests	Pre- test			Post- test			T test	Significant
		N	Mean	Deviation	N	Mean	Deviation		
1	Heart rate	11	72.18	2.786	11	71.09	2.700	2.058	No
2	SYS pressure	11	120.23	5.880	11	120.09	4.460	0.192	No
3	DIA pressure	11	66.84	3.964	11	65.82	4.381	0.787	No
4	Calcium	11	10.13	2.935	11	6.64	1.912	6.817	S
5	Magnesium	11	6.02	1.267	11	12.27	2.195	9.527	S
6	Ferum	11	179.68	14.622	11	146.09	15.928	8.331	S
7	Phosphor	11	10.86	1.382	11	13.86	0.175	3.256	S
8	Glucose	11	193.41	21.925	11	188.02	4.872	5.412	S

Tabulate T = 2.228, Significant level (0.05), Freedom degree (10).

(Table 3)
Shows physiological and biochemical markers tests of control group

N	Tests	Pre- test			Post- test			T test	Significant
		N	Mean	Deviation	N	Mean	Deviation		
1	Heart rate	11	71.73	2.533	11	69.64	1.804	2.101	No
2	SYS pressure	11	119.73	4.860	11	121.09	4.908	0.828	No
3	DIA pressure	11	66.30	4.381	11	67.91	4.721	1.182	No
4	Calcium	11	9.91	2.663	11	9.64	2.767	1.150	No
5	Magnesium	11	5.91	1.578	11	8.45	0.820	4.981	S
6	Ferum	11	178.18	13.884	11	123.55	15.076	7.738	S
7	Phosphor	11	10.45	1.214	11	11.45	2.530	1.258	No
8	Glucose	11	203.00	32.212	11	198.00	5.693	3.025	S

Tabulate T = 2.228, Significant level (0.05), Freedom degree (10).

No significant ($P<0.05$) improvements in the heart rate was reported among the two groups players when comparing post and post-tests. No significant difference ($P<0.05$) in the blood pressure levels (SYS) was observed among two group players in post and post-tests, with no significant change in blood pressure (DIA) in two groups too. A significant change was noted in the calcium levels of two groups in post and post-tests (Table 5). Magnesium level reduced significantly ($P<0.05$) among two groups when comparing post-test with post-test. Moreover, when comparing post-test of ferum level of experiment group with post-test of control group was significant reduction, a significant ($P<0.05$) reduce in the phosphor level was reported among the players of two groups in post and post-tests. A significant difference among post and post-tests in glucose level (Table 5).

(Table 5)
Shows physiological and biochemical markers tests of two groups in post-tests

N	Tests	Experiment group			Control group			T test	Significant
		N	Mean	Deviation	N	Mean	Deviation		
1	Heart rate	11	71.09	2.700	11	69.64	1.804	1.489	No
2	SYS pressure	11	120.09	4.460	11	121.09	4.908	0.500	No
3	DIA pressure	11	65.82	4.381	11	67.91	4.721	1.093	No
4	Calcium	11	6.64	1.912	11	9.64	2.767	2.959	S
5	Magnesium	11	12.27	2.195	11	8.45	0.820	5.404	S
6	Ferum	11	146.09	15.928	11	123.55	15.076	3.410	S
7	Phosphor	11	13.86	0.175	11	11.45	2.530	2.589	S
8	Glucose	11	188.02	4.872	11	198.00	5.693	2.886	S

Tabulate T = 2.086, Significant level (0.05), Freedom degree (20).

In current study no significant difference was observed in heart rate among the women's football players after the training program with additional weight and with no additional weight in two groups. It may be due to the short duration of the training or improper optimization of the training load. It has been reported that short term exercise training has no significant effect on heart rate in women's football players (Mc Ardle *et al.*, 2006; Wilmore and Costill., 2005).

Heart rate rises with an increase in work intensity and shows a linear relationship with work rate (Astrand and Rodhal., 1986). The highest rate at which the heart can beat is the maximal heart rate (HRmax). Fast recovery from exercise is important in football which includes discontinuous efforts interspersed with short rests (Rampinini *et al.*, 2007). The heart rate improvement needs more time of training program (Astrand and Rodhal., 1986). No significant difference ($P<0.05$) in high and low blood pressure was observed among two groups after the training program with and without additional weight used here. It may be due to short duration of the training too.

Our findings are consistent with earlier reports of no significant effect on high and low blood pressure in football players after short time of training (Pescatello *et al*., 1991). In addition, Researchers suggested that no significant difference in heart rate resulted in no change or improve in high and low blood pressure. In biochemical markers (e.g calcium, magnesium, ferum, phosphor, and glucose) a significant changes after training in experiment group but no in control group. It may be because of high intensity with additional weight and suitable duration of training. The finding of this study is consistent with recent study of a significant difference on calcium levels after training in women's volleyball players, Peak power of the trained leg was 10% and 14% greater than that in the untrained leg in women's volleyball players, respectively.

For the subject training resulted in a higher Ca 2+ release rate and a lower leak in the trained leg associated with a tendency of increased ryanodine receptor (RyR) content with reduced phosphorylation level. In the trained leg of women's players, RyR content was reduced without associated changes of either Ca 2+ leak or release rate (Ammar H., 2010). In the review of McKenna et al (1996) found that training enhances Ca^{2+} and K^{+} and reduce muscular fatigue ability. However, a calcium deficiency is a potentially serious and progressive structural problem, the effects of which are cumulative in nature. If calcium intake is below what the body requires, bones tend to become thin and more brittle, a condition known as osteoporosis. This condition typically occurs in persons over the age of 45, and more commonly in women than men (Faqs.org., 2010).

The present study showed that the level of magnesium and phosphor increased ($P<0.05$) after training among the players of experiment group. However, the magnesium and phosphor levels were found to be in the normal range. The highest levels of magnesium and phosphor were found to be in the experiment group when the performance level is the highest due to additional weight. It is believed that a pronounced increase in blood indicates strong influence of a training with additional weight (Hameed and Ammar., 2011). A recent study suggested that magnesium and phosphor are involved in numerous processes that affect muscle function including oxygen uptake, energy production and electrolyte balance. Thus, the relationship between magnesium and phosphor status and exercise has received significant research attention.

This research has shown that exercise induces a redistribution of magnesium and phosphor in the body to accommodate metabolic needs. There is evidence that marginal magnesium and phosphor deficiency impair exercise performance and amplifies the negative consequences of strenuous exercise (e.g., oxidative stress) (Forrest *et al*., 2006; John and Anderson., 1996) as shown in control group. Ferum and glucose indicate the metabolic status of athletes; Activity levels have significant impacts on the Ferum and glucose levels of athletes (Pamela *et al*., 2000). As the performance level increased during the training phase, the level of total Ferum and glucose decreased ($P<0.05$) gradually. It indicates that as the training load and performance level with additional weight increase the level of total Ferum and glucose decrease gradually with an increase in calcium, magnesium and phosphor levels. The possible reason for the reduction in total Ferum and glucose and elevation in calcium, magnesium and phosphor are exercise training (Ammar H., 2010; Forrest *et al*., 2006; John and Anderson., 1996).

Our findings are supported by observations of other researchers in their recent studies (Hameed and Ammar., 2011; John and Anderson., 1996).

4. Conclusion

Training effects were reflected on various markers like biomechanical but no physiological of Iraq women's football players. The unique profile of additional weight-related changes should be taken into consideration while administering training to the women players. Since studies on football players are limited in Iraq, the data of the present study can be a handy tool and can act as a frame of reference for monitoring the training courses of women's football players of aged 30-35yer. This would enable coaches to evaluate the current status of an athlete and the degree of training flexibility and to provide an opportunity to modify the training schedule accordingly to perform the desired performance. The effect of training can also be studied at different training programs to detect the effect of a particular training goal on the women players. The study was limited to football players, however similar studies can be achieved in other sports fields. Selected physiological and biochemical variables were measured in the present study, however with the progression of science and technology some more variables may be considered as well as new equipments can be used for valuation of variables.

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