Study the Relationship between Competition Load and Some Thyroid, Adrenal, and Pituitary Glands'hormones Concentration in Blood Plasma for Track Racers

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Abstract: Studying relationship between the impact of competition load in the work of endocrine glands is to somewhat new recent and largely correlated with major developments in sport biology and physiology science. It is well known that physical effort affects activity of many glands and hormone production rates like thyroid gland which secretes thyroxine hormone (T4) and thyronine (T3), which rotate in free form (FREE (F)) or united in blood. It is known that it affects the overall organization of metabolism, growth and tissue contrast as well as gene expression. Thyroid hormone increases metabolic actions in almost each tissue; it also increases the size and number of mitochondria in cells and its effectiveness, this in turn increase speed of triphosphate adenosine (ATP) formation to feed cellular energy with fuel needed for effort to be done for individual, especially athlete who needs great energy in depending on each requirements according to regulations in force. Although thyroid hormone is vital to many physiological system; but biological effects of short-term changes in thyroid hormone levels resulting from physical effort not fully explained yet. From what mentioned above the great importance of these hormones is clear, where correlation between competition load and these hormones not precisely specified, especially these hormones play great role in the metabolism which prompted researchers to conduct such a study and its importance to find the relationship between concentration level of thyroid hormones: associated and free T3 & T4 and adrenal cortisol hormone CO and pituitary hormone: thyrotropin TSH in blood plasma according to competition load within track racers (100m, 400m, 1500m, 5000m) hoping to present results probably will contribute to shed light in this field. Researchers used experimental approach with pre and post measurement for its relevance to research nature. Research sample included 24 male runners, their age between 20 to 29 years old were selected from first-class runners in Western Region represented for short-distance distance runners (100, 400 m), average-distance runners (1500 m), long-distance runners (5000 m). Statistical work done using SPSS program and includes (Mean - Standard deviation- Skewness – Kurtosis- Simple correlation). Most important results were that there were statistically significant correlation between competition load and changes in associated and free thyroid hormones (T3 & T4), Cortisol, thyrotropin TSH in blood plasma in (100 m, 400 m, 1500m 5000 m) in pre and most measurements, there were statistically significant correlation between competition load and changes in associated and free thyroid hormones (T3 & T4), Cortisol, thyrotropin TSH in blood plasma in (100 m, 400 m, 1500m 5000 m) between pres and post-measurements (immediately after competition), most important recommendation were necessity to give concern to nature of relations between activity of associated and free thyroid hormones T3, and T4 and cortisol CO and hormone thyrotropin TSH accordance to competition load, necessity to focus on training methods according to energy production, which in turn improves thyroid, and adrenal hormones (energy hormones) and pituitary gland hormone.

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Introduction

Studying relationship between the impact of competition load in the work of endocrine glands is to somewhat new recent and largely correlated with major developments in sport biology and physiology science. It is well known that physical effort affects activity of many glands and hormone production rates like thyroid gland which secretes thyroxinehormone (T4) and thyronine (T3), which rotate in free form (FREE (F)) or united in blood.It is known that it affects the overall organization of metabolism, growth and tissue contrast as well as gene expression.

Thyroid hormone increases metabolic actions in almost each tissue; it also increases the size and number of mitochondria in cells and its effectiveness, this in turn increase speed of triphosphate adenosine (ATP) formation to feed cellular energy with fuel needed for effort to be done for individual, especially athlete who needs great energy in depending on each

requirements according to regulations in force. (Saad Eddin Mohamed EL Mekawy, 2000: p139).

Majority of our bodies organs depend on energy form of ATP; large molecules turn to ATP through glycogen, TCA cycle,and phosphorylation oxidative in mitochondria which produces ATP which enable our bodies to perform metabolism work,as soon as ATP levels start falling as soon as physiological processes decrease than ideal level and emergency signs and symptoms appear.

Referring to system hierarchical setup, it will be clear that lower energy metabolism must include thyroid which work to speed up metabolism process in the body; pituitary gland is the " prevailing gland "control maximum activity of thyroid gland through TSHhormone; while adrenal glands, which deals with all pressure forms using cortisol hormone, and these three glands play huge role in energy metabolism. (Dicken Weather by, 2009) (kursatkaracabey, 2005)

Although thyroid hormone is vital to many physiological system; but biological effects of short-term changes in thyroid hormone levels resulting from physical effort not fully explained yet, Many research studies argued that physical effort cause significant lack in T3 and T4 concentrations (McMurray RG. et al, 1995); other studies reported that physical effort had no effect on any of these hormones (Malik Beyleroglu, 2011), but other studies reported that thyroid hormone increases in response to exercise (DumaE et al, 1998), Difference between studies results may be due to differences in methodology and experimental procedures, or differences in sample measurements. This research results ambiguity points to the need for further studies on this subject in an attempt to explain it.

The adrenal glands have many metabolic functions, and the most important is to help body to maintain stability in face of both internal and external pressures in many forms either physical, emotional, biological and extra metabolism excitement in result of extra thyroid secretion, Dealing with the pressure performed through production of cortisol hormone which has significant impact on metabolic processes acceleration, especially carbohydrate, protein and fatmetabolism. (Dicken Weatherby, 2009)

Several research studies have been conducted on cortisol hormone, where results contradict as some studies show cortisol concentration increased after light, medium intensity physical effort, other studies indicate cortisol concentration decrease with same effort intensity other studies again suggest that there is no change at all.(AbuEleala Ahmed Abdel Fattah, 2003: p113) (Hashim Adnan al-Kilani, 2005: p426)

It was suggested that there is negative retroactively regulation between T3 & T4 hormones forom one side and cortisol hormone in the other side as increase in any of them cause decrease in secretion of other; thus due to that these two groups of hormones are working alternately with each other to produce energy. (Medhat Hussein Khalil, 2002: p222)

From what mentioned above the great importance of these hormones is clear, where correlation between competition load and these hormones not precisely specified, especially these hormones play a big role in the metabolism which prompted researchers to conduct such a study and its importance to find the relationship between concentration level of thyroid hormones: associated and free T3 & T4 and adrenal cortisol hormone CO and pituitary hormone: thyrotropin TSH in blood plasma according to competition load within in track racers, hoping to present results probably will contribute to shed light in this field.

Research importance:

Scientific importance of this study represented in introduce new addition to determine the relationship between each of united and free thyroid hormonal T3& T4, adrenal cortisol hormone CO and pituitary thyrotropin hormone TSH in blood plasma, according to competition load for track racers (100 m, 400 m, 1500m 5000 m).

Research Objective:

This research aim to identify the relationship between united and free thyroid hormonal T3& T4, adrenal cortisol hormone CO and pituitary thyrotropin hormone TSH in blood plasma, according to competition load for track racers (100 m, 400 m, 1500m 5000 m).

Research queries:

1- Is there statistically significant correlation between competition load and concentration level change of united and free thyroid hormonal T3& T4 in blood plasma, according to competition load for track racers (100 m, 400 m, 1500m 5000 m).
2- Is there statistically significant correlation between competition load and concentration level change of adrenal cortisol hormone CO in blood plasma, according to competition load for track racers (100 m, 400 m, 1500m 5000 m).
3- Is there statistically significant correlation between competition load and concentration level change of pituitary thyrotropin hormone TSH in blood plasma, according to competition load for track racers (100 m, 400 m, 1500m 5000 m).

Research Terminology:

Thyroxine(T4)

It is an iodine-containing hormone secreted by the thyroid gland, it conmtained 1/5 of body iodine occurring naturally as l-thyroxine; its chief function is to increase the rate of cell metabolism. It is

deiodinated in peripheral tissues to form triiodothyronine, which has greater biological activity. on all metabolic processes in terms of both speed or regulate its work to increase the speed of muscle oxygen use, increase emission of energy needed by body and works to reduce speed of phosphate oxidation. (Saad Eddin Mohamed EL Mekawy, 2000: p8)

Triiodothyronine (T3)

One of the thyroid hormones, an organic iodine-containing compound liberated from thyroglobulin by hydrolysis it in outer tissue, it is available either associated or non-associated with protein. (Saad Eddin Mohamed EL Mekawy, 2000: p8)

Thyrotropin (TSH)

A glycoprotein hormone secreted by the anterior lobe of the pituitary gland that stimulates and regulates activity of the thyroid gland, according to reverse link theory and by thyroid hormone itself. (Medhat Hussein Khalil, 2002: p169)

Cortisol (co)

It is the major natural glucocorticoid elaborated by the adrenal cortex; it affects the metabolism of glucose, protein, and fats and has mineralocorticoid activity (Medhat Hussein Khalil, 2002: p354)

Reference studies:-

1 - Malik Beyleroglu (2011) Studyentitled: Effect of maximum aerobic exercise on cortisol and thyroid hormones withinhockey players. study aimed to identify changes in thyroid hormones associated with shuttle run exercise, sample size were 14 hockey players. hormone cortisol, TSH,FT3 and FT4 measured three times: before exercise, immediately after exercise, and after an hour of exercise. The most important results there was no statistically significant differences between the three measurements in TSH serum levels and thyroid hormones, however, there were significant decrease of FT3 and TSH one hour after exercise, while not change was noted in FT4 and cortisol concentrations increased slightly immediately after shuttlerun exercise.

2 - **MahaA. et al (2011)** Studyentitled: Estimating thyroid hormones in within Faculty of Physical Education students after exercise. Thisstudy aimed to identify the impact of Exercise levels on thyroid hormones (T3, T4)in the blood serum within young shealthy students. 30 students from Faculty of Physical Education at Tikrit University participated in this study. This study was conducted from December to the end of February 2011. Subjects age were between of 20 - 22 Year (20.53 ± 1.73 years). The exercise includes 5-minute warm-up and then 9 minutes of exercise was applied for students with gradually increasing intensity every 3 minutes (starting from 50, 100, 150 watts) to up to 75% of maximum heart rate. Blood samples were taken five minutes before and after exercise. T3, T4 and stimulating thyroid gland hormone were measured before and after exercise. heart rate was measured at rest before starting exercise and then after 1, 2, 3 minutes after the end of exercise (heart rate after exercise). The main findings: There was no significant difference between T3 before and after exercise. There was a slight decrease in T3 serum level after exercise. There was no difference between thyroxin T4before and after exercise.

3 - **Mohammad, J. et al (2009)** study entitled: change of thyroid hormone serum and catalyst within men athletes on Nano scale. The study aimed to identify the changes of serum hormone (T3) and thyroid hormone (TSH) concentration, according to Nano mm and Nano 1U Micro liter within players. 12 volunteer students represented research sample. In 1st phase 5CC of blood obtained from individuals then every one of them preformed BRUCE aerobic test protocol on treadmill. In 2nd phase blood obtained immediately after training protocol. In 3rd phase blood obtained after hours rest; i.e. blood obtained 3 times. Results revealed that TSH hormone serum has increased to 0.533% N1U / MICL immediately after exercise training and this increase was significant (P = 0.048) TSH serum hormone average between 2nd phase and after 24 hours rest hour rest showed average decrease to 41.38% N 1U / MICL with significance (P = 0.039). TSH serum hormone average change between first stage and after BRUCE training protocol was not significant (P = 0.214). T3 serum hormone average change between 1st phase and after 24 hours rest was significant (decrease = 9.27% NG / ML,P = 0.022). It was concluded that BRUCE training protocol induced TSH hormone and this hormone showed its impression on thyroid and produced T3, T4 hormones causing shifts in body metabolism. After TSH hormone secretion it took time to show its effect on thyroid gland and cause T3 hormone secretion and this period has not been specified yet in physical exercise.

4 - Anthony et al (2009), Study entitled**:** Thyroid hormones and the interrelationship of cortisol and prolactin: influence of prolonged, exhaustive exercise. Study aimed to identify how long and exhaustive exercise affect thyroid hormones and the interrelationship of cortisol and prolactin responses for such exercise on thyroid hormones, study sample were male individuals performed running on treadmill according to individual aerobic threshold till exhausting samples were taken before exercise, at rest, and at the beginning (BL) BASELINE and at exhausting (EXH), 30, 60, 90 minutes within recovery (30 MR, 60MR, 90 RC) and after 24 hours of recovery after exercise (24HR). Blood samples for FT3 and FT4, and thyroid hormone (TSH) cortisol and

prolactin. Themost important results ANOVA analysis revealed that at EXH (exhausting) all hormones increased than BL (P<0.01) Cortisol and prolactin increase still significance (P<0.05). at 90 MR hormones did not differ from BL levels. At 24 RH cortisol FT3 and TSH decreased from BL (P <0.05). Correlation analysis results revealed that responses of EXH cortisol correlated with TSH responses at 24 HR (R5 = 0.69 <0.D) In addition, cortisol 24H responses were correlated (R = 0.51, P <0.02), prolactin and TSH EXH were correlated (r5= T 0.56.P< 0.01) and prolactin 30MR and TSH exhausted were correlated (r5= T 0.43.P< 0.050.05).

5 -M.Grandys, J.et al (2008) study entitled: The effect of endurance training on muscle strength in young, healthy men in relation to hormonal status. Study aims to identify the impact of moderate intensity endurance exercise strength on hormonal changes in body. Sample was 15 youngsters participated in the performance of endurance exercise on argometer for 5 days with two different types of exercise protocols of the same period 40 minutes the first type continuous endurance and second Type intermittently exercise. Blood samples taken before and after the training program testosterone, cortisol, growth, FT3 and FT4hotmones, insulin and albumin were measured. Most important results indicated that the training program led to significant increase in testosterone T, ft and significant decrease in growth, FT3 and FT4 hormones There were no changes in plasma cortisol and insulin.

6 – Figen Ciloglu et al (2005) study entitled: Exercise intensity and its effects on thyroid hormones. study aimed study to identify the impact different intensity aerobic exercise on thyroid hormones, sample size were 60 for male well-trained players, performance have been done using argometerat 45% (Low intensity) and 70% (Intermediate intensity) and 90% (High intensity) and these intensities have been selected according to the maximum heart rate (MHR). at each intensity heart rate, blood lactic acid, thyroxine T4 and free thyroxine (FT4) all free Free Triiodothyronine(FT3), T3 and thyroid exciting hormone (TSH) were measured. The results of this study showed that the exercise, which was to be performed at 70% threshold of maximum heart rate, and lactic level of 4.59 ±1.75 caused the most visible changes in the amount of the value of any hormone. Rates of T4, FT4, TSH continued to rise at 90% of heart rate; while T3, FT3 began to decrease; so maximum intensity aerobic exercise affects to large degree the thyroid hormones cycle.

7-**Wen-sheng Huang et al (2004)** study entitled: effect of treadmill exercise on circulating thyroid hormone measurements. Study aims to observe the impact of treadmill exercise on values thyroid hormone cycle in TH serum,sample size was 26 healthy military male, 23 - 27 years (average 25 years), all maintained identical meal and physical activity for a week before the test, serum samples were obtained prior to the start of the experiment and then immediately after the 1, 4, 24, and 48 hours of maximum exercise on Bruci treadmill Protocol).all individuals completed the protocol with normal ECG results, samples were analyzed to measure TSH, FT3, FT4, T4, T3 in the same laboratory, Most important results showed blood concentration, increase (HCT) increase immediately after exercise. No changes in TH average serum values before and after exercise, except in the TSH, which has increased significantly after exercise directly to 1.72 against base value of 14/L 1.42 (P <0.01) and values of the TSH, T4, T3 increased significantly directly after exercise compared other after exercise values but the changes became insignificant after adjusting the HCT. FT4 showed reciprocal increase after exercise and became significant after adjusting HCT. Significant negative relationship found between FT4 and TSH values, but these values are still within normal limits.

8 C. Simsch, W. et al (2002) Study entitled: Training intensity influences leptin and thyroid hormones in highly trained rowers study aims to clarify whether there is a link between these systems that have central and surface organization and study the effect of different training intensities on the (L) and TSH and thyroid hormones within rowing players (18.9 + / -2.6 years) training has been done in the high-intensity resistance (RT) for 3 weeks followed by 3 weeks of endurance training and after each training session individuals got one week to recover. Blood sampleswere taken before and at the end of resistance training,after 1st recovery week,after endurance training and after 2nd recovery week. Most important showed clear decrease of L, TSH and FT3,no change in FT4 and after endurance training there were significant increase in TSH.

9 - Jose L. Chicharro (2001) study entitled: Thyroid hormone levels during a 3-week professional road cyclingcompetition.This study aims to find out the levels of thyroid hormone for professional bikes riders during 3 weeks competition. Sample size was 16 male cyclists from two pioneer teams in the world, blood samples was taken 4 times (between 7 am and 9 am) from each participant before and at the end of first week, second week, third week of competition. TSH, FT4, T4, FT3, T3 have been identified in each blood sample using immunity radio analysis. Themost important results showed that FT4, T4 serum levels increased (P <0.05) at the end of the last week of competition, while T3 and TSH concentrations did not change.

- Commentary on the reference studies

Reference studies varied approaches contributed to shed light on many key points that could be used in the current study where these studies helped researchers to clarify study plan, sample and data collection tools. There were also differences in procedures where these studies results did not agree in terms of level change, increase or decrease in free and total T4 &T3, cortisol CO, and thyrotropin TSH hormones in blood plasma resulting from physical effort effect. Studies results differed also in T4 & T3 hormones concentration level in blood plasma after performing aerobic and anaerobicexercises.Results differed alsoin concentration of cortisol CO and thyrotropin TSH in blood plasma after performing aerobic as well as anaerobic exercises.As far as researchers know there is lack of studies concerned with change in concentration level of total and free T4 & T3 hormones, cortisol CO and thyrotropin TSH in blood plasma of athletes according to competition load (anaerobic, mixed and aerobic) and find relationship between them; which called the researchers for conducting this study.

- Research procedures:

- Research Methodology:

Researchers usedexperimental approach with pre and post measurement for its relevance to research nature.

- **Research domains:**

- Human domain: First-class racers in the Western Region for short distances (100 m and 400m), medium (1500 m) and long (5000 m).

- **Spatial domain**: Pre and post measurements conducted for blood samples withdrawal from runnersathletics conducted in track and field of Tripoli sports city of, samples then transferred to a Tripoli central authorized laboratory.

- **Time domain**: This research measurementshave been done on morning of October 15th, 2012 during Western Region Championship in Libya.

- Research sample:

Research sample included 24 male runners, their age between 20 to 29 years old were selected from first-class runners in Western Region represented in:

1st Group:

Six short-distance runners (100 m) representing phosphate anaerobic physical effort.

2nd group:

Six short-distance runners (400 m) representing lactic anaerobic physical effort.

3rd Group:

Six average-distance runners (1500 m), representing mixed physical effort.

4th Group:

Six long-distance runners (5000 m) representing aerobic physical effort.

Variables distribution normality: -

To make sure that sample is free from normality distributions researchers calculated mean, standard deviation, skewness and kurtosis coefficients for variables under consideration as follows:

Table (1) Mean, standard deviation, skewnessand kurtosis coefficient for research sample in biochemical variables n = 24

Statistics / Variables	Measurement Unit	Mean	Standard Deviation	Skewness	Kurtosis
T3	NMOL/L	1.07	0.15	0.21	-1.29
FT3	NMOL/L	2.93	0.28	-0.46	-0.11
T4	NMOL/L	7.36	0.82	0.5	-0.88
TSH	NMOL/L	2.06	0.74	0.54	0.35
FT4	NMOL/L	0.97	0.19	0	-1.18
CO	NMOL/L	28.96	8.82	0.1	-1.27

Table (1) results revealed that biochemicalvariables for study samples follow normal distribution (normal curve) as skewness factor ranged between (-0.46, 0.54) i.e. within ± 3 and this give direct indication that sample represents normal society free of defects of non normal distributions

Research implementation steps:

- Administrative and organization phase:

1. Getting coaches and players approval for withdrawing blood sample at competition day after clarifying study purpose.
2. Prepare data registration form for competitors.
3. Preparing all study tools for withdrawing blood sample (centrifuges to separate blood samples - test tubes for blood sample analysis - holder tubes - White Alcohol - plastic syringes – medical wool - blood transfusion tool).

Implementation phase:

Study was conducted during the time specified by Western Region Competitions Committee at tournament day October15th 2012 in Tripoli sports city on a sample of 24 athletic runners from western region during the morning period within tournament schedule according to the following time: 9.13 am 100 m sprint men9:30 am 400 m9.45 am 1500m 10.00 morning 5000m

Measurements used in the search

Biochemical measurements

- Thyroxinehormone (includes associated T4 and free FT4).
- Triiodothyronine (includes associated T3 and free FT4).
- Stimulating thyrotropin hormone (TSH)
- Cortisol hormone (CO)
-

Pre- Measurements:

Pre-measurement taken before competition start, where 5 cm blood sample was withdrawn by analysis technical and then put the blood samples in private blood cases.

Post-measurements

Pos- measurement taken directly at the first minute after end of competition, blood sample was withdrawn with same procedures as pre-measurements, then put in blood cases blood and immediately transported to the laboratory.

-Statistical Work:

Statistical work done using SPSS program and includes:

- Mean.
- Standard deviation.
- Skewness
- Kurtosis
- Simple correlation

Discussion of the results

Table (2), which shows Simple correlation matrix between competition loadand change level of thyroid hormone(associated and Free T4 & T3), cortisol (CO) and thyrotropin (TSH) in blood plasma for track racers (100 m, 400 m, 1500 m 5000 m) in pre-measurement, revealed correlation in some biochemical variables as follows:

In 100 meters race there was negative a correlation between FT3, T4 hormone at (0.05) significance level; correlation coefficient valued to (-0.859). There was also negative correlation between TSH, FT3 at (0.01) significance level, correlation coefficient valued to (-0.962).There was also strong positive correlation between FT4, T4; correlation coefficient valued to (0.999) at (0.01), (0.05) significance level respectively, also found positive correlation for variables CO, T3, CO, TSH at (0.01) significance level.

In 400 meters race there was negative a correlation between FT3, T3 hormone at (0.05) significance level; correlation coefficientvalued to (-0.854). There was also strong positive correlation between TSH, T3 at (0.01) significance level, correlation coefficient valued to (0.959).There was also negative correlation between TSH, FT4; correlation coefficient valued to (-0.966) at (0.01)significance level, also found strong positive correlation between FT3, and FT4 at 0.01 significance level, correlation coefficient valued to (0.983). There was negative relationship between FT4 and TSH, T3 at (0.01) significance level, correlation coefficient valued to (-0.936), (-0.997) respectively; while there was strong positive correlation between CO, FT3, FT4, at (0.01), (0.05) significance levels, correlation coefficient valued to (0.945), (0.869) respectively. There was negative correlation between CO, TSH at (0.05) significance level, correlation coefficient valued to (-0.830)

In 1500 meters race there was strong positive correlation between T3, T4 hormone at (0.01) significance level; correlation coefficientvalued to (0.936). There was also negative correlation between TSH, T4 at (0.05) significance level, correlation coefficient valued to (-0.836).There was also strong positive correlation between FT3 and T3, T4; correlation coefficient valued to (0.985), (0.983) respectively at (0.05)significance level, also found negative correlation between CO, and T3 at 0.01 significance level, correlation coefficient valued to (1.00).

In 5000 meters race there was strong positive correlation between FT3, T3 hormone at (0.01) significance level; correlation coefficientvalued to (0.935). There was also positive correlation between T4, and T3, FT3 at (0.05) (0.01) significance levels, correlation coefficientsvalued to (0.844) (0.953). There was also strong positive correlation between TSH and T3, FT3, T4; correlation coefficient valued to (0.854) (0.959) (1.00) respectively at (0.05) (0.01) significance level, also found positive correlation between CO, and FT4 at 0.01 significance level, correlation coefficient valued to (0.962).

It was also revealed existence of correlation between the four races (100 m, 400 m, 1500 m, 5000 m) in pre-measurement between thyroid hormones (associated and free T3, T4) cortisol CO and thyrotropin TSH in blood plasma. It was found correlation between 100 m, 400 mraces, as follows:

Table (2): Simple correlation matrix between competition loadand change level of thyroid hormone(associated and Free T4 & T3), cortisol (CO) and thyrotropin(TSH) in blood plasma for track racers (100 m, 400 m, 1500 m 5000 m) in pre-measurement

Races		100 meter						400 meter					
	VARIABLES	T3	FT3	T4	TSH	FT4	CO	T3	FT3	T4	TSH	FT4	CO
100 METER	T3	1											
	FT3	0.856-*	1										
	T4	0.788	-0.357	1									
	TSH	0.683	0.962-**	0.09	1								
	FT4	0.76	-0.314	0.999**	0.045	1							
	CO	0.951**	0.974-**	0.558	0.876*	0.52	1						
400 METER	T3	0.014	-0.529	-0.604	0.74	-0.639	0.324	1					
	FT3	-0.532	0.893*	0.102	0.982-**	0.146	-0.769	0.854-*	1				
	T4	0.813*	-0.395	0.999**	0.131	0.996**	0.592	-0.57	0.06	1			
	TSH	0.296	-0.747	-0.354	0.900*	-0.396	0.578	0.959**	0.966-**	-0.315	1		
	FT4	-0.367	0.795	0.284	0.930-**	0.327	-0.637	0.936-**	0.983**	0.244	0.997-**	1	
	CO	-0.779	0.991**	-0.229	0.990-**	-0.184	0.935-**	-0.638	0.945**	-0.269	0.830-*	0.869*	1
1500 METER	T3	-0.522	0.005	0.936-**	0.266	0.951-**	-0.231	0.846*	-0.445	0.921-**	0.66	-0.603	-0.128
	FT3	0.946**	-0.643	.945**	0.41	.929**	0.799	-0.31	-0.229	0.958**	-0.029	-0.046	-0.534
	T4	-0.189	-0.346	-0.753	0.588	-0.782	0.126	0.979**	-0.731	-0.725	0.882*	0.845-*	-0.469
	TSH	-0.382	0.805	0.268	0.936-**	0.311	-0.65	0.930-**	0.986**	0.228	0.996-**	1.000**	0.877*
	FT4	-0.368	-0.166	-.862-*	0.427	-0.884-*	-0.061	.924**	-0.592	0.840-*	0.779	-0.73	-0.296
	CO	0.942-**	0.634	0.949-**	-0.4	0.933-**	-0.792	0.321	0.218	0.961-**	0.04	0.034	0.525
5000 METER	T3	0.875*	0.999-**	0.393	0.951**	0.351	0.982**	0.496	0.875-*	0.43	0.721	-0.771	0.985-**
	FT3	0.722	0.976-**	0.144	0.998**	0.099	.901*	0.702	0.970-**	0.185	0.875*	0.908-*	0.996-**
	T4	0.48	0.864-*	-0.162	0.968**	-0.206	0.728	0.884*	0.998-**	-0.121	0.980**	0.992-**	0.924-**
	TSH	0.496	0.874-*	-0.143	0.973**	-0.187	0.741	0.875*	0.999-**	-0.102	0.976**	0.990-**	0.931-**
	FT4	0.908*	-0.561	0.974**	0.315	0.962**	0.733	-0.406	-0.129	0.982**	-0.131	0.057	-0.445
	CO	0.76	-0.315	0.999**	0.045	1.000**	0.521	-0.639	0.146	0.996**	-0.395	0.326	-0.185

RACES		1500 METER						5000 METER					
	VARIABLES	T3	FT3	T4	TSH	FT4	CO	T3	FT3	T4	TSH	FT4	CO
1500 METER	T3	1											
	FT3	–0.77	1										
	T4	0.936**	–0.497	1									
	TSH	–0.59	–0.062	0.836–*	1								
	FT4	0.985**	–0.649	0.983**	–0.719	1							
	CO	0.777	1.000–**	0.506	0.051	0.658	1						
5000 METE	T3	–0.044	0.672	0.31	–0.781	0.127	–0.663	1					
	FT3	0.213	0.46	0.543	0.915–*	0.377	–0.45	0.967**	1				
	T4	0.499	0.17	0.771	0.994–**	0.639	–0.159	0.844*	0.953**	1			
	TSH	0.482	0.188	0.759	0.992–**	0.625	–0.178	0.854*	0.959**	1.000**	1		
	FT4	0.831–*	0.995**	–0.583	0.04	–0.724	0.996–**	0.592	0.367	0.068	0.087	1	
	CO	0.951–**	0.930**	–0.781	0.31	0.884–*	0.934–	0.351	0.1	0.205	0.187	0.962**	1

* Significant at 0.05 = 0.811; * Significant at 0.01 = 0.917

Table (2) results revealed existence of statistically significance correlation between competition loadand changes level of thyroid hormone free and associated T3, T4, competition load and cortisol CO and thyrotropinTSH and statistically significant correlation between changes level of thyroid hormone and cortisol within track runners (100 m, 400 m, 1500 m, 5000 m) in pre-measurement.

Table (3)Simple correlation matrix between competition load and change level of thyroid hormone(associated and Free T4 & T3), cortisol (CO) and thyrotropin (TSH) in blood plasma for track racers (100 m, 400 m, 1500 m 5000 m) in post-measurement (immediately after race)

Races		100 meter						400 meter					
	VARIABLES	T3	FT3	T4	TSH	FT4	CO	T3	FT3	T4	TSH	FT4	CO
100 METER	T3												
	FT3	-0.998(**)											
	T4	1.000(**)	-0.998(**)										
	TSH	0.836(*)	-0.803	.839(*)0									
	FT4	0.956(**)	-.971(**)	.954(**)0	0.637								
	CO	-0.26	0.205	-0.266	-0.748	0.036							
400 METER	T3	0.861(*)	-.831(*)	.864(*)	.999(**)	0.673	-0.715						
	FT3	-0.373	0.32	-0.379	-.821(*)	-0.084	.993(**)	-0.793					
	T4	0.382	-0.433	0.376	-0.189	0.637	0.793	-0.142	0.715				
	TSH	1.000(**)	-.997(**)	1.000(**)	0.849(*)	.948(**)	-0.284	.873(*)	-0.396	0.359			
	FT4	0.354	-0.407	0.349	-0.217	0.614	0.811	-0.17	0.735	1.000(**)	0.331		
	CO	-0.804	0.836(*)	-0.801	-0.346	-.944(**)	-0.364	-0.39	-0.251	-.856(*)	-0.789	-.841(*)	
1500 METER	T3	-0.879(*)	0.817(*)	-0.552	0.241	-0.261	-0.73	-0.999(**)	0.41	-0.051	-0.286	0.266	-0.281
	FT3	.851(*)	-0.848(*)	0.598	-0.295	0.315	0.768	0.771	0.23	-0.567	0.811	-0.798	-0.361
	T4	-.882(*)	0.813(*)	-0.547	0.235	-0.255	-0.726	0.105	.845(*)	-0.981(**)	.989(**)	-.992(**)	-.910(*)
	TSH	-.996(**)	0.366	-0.004	-0.332	0.312	-0.235	-.891(*)	0.802	-0.531	0.217	-0.237	-0.713
	FT4	-0.7	0.951(**)	-0.773	0.516	-0.534	-.899(*)	0.134	.829(*)	-.975(**)	.993(**)	-.995(**)	-.898(*)
	CO	0.689	0.344	-0.661	.874(*)	-.864(*)	-0.47	0.424	-1.000(**)	.940(**)	-0.77	0.784	.993(**)
5000 METER	T3	0.999(**)	0.886(*)	0.407	0.093	0.553	0.454	0.882(*)	.999(**)	.815(*)	0.587	0.053	-0.062
	FT3	-.995(**)	-0.859(*)	-0.355	-0.037	-0.599	-0.504	-0.412	-0.76	-.999(**)	-.959(**)	0.566	0.657
	T4	.999(**)	0.889(*)	0.412	0.1	0.548	0.449	0.342	-0.09	-0.689	-.885(*)	.981(**)	.997(**)
	TSH	.858(*)	0.995(**)	.842(*)	0.625	0.005	-0.109	1.000(**)	.898(*)	0.429	0.118	0.532	0.432
	FT4	.942(**)	0.711	0.12	-0.204	0.774	0.697	0.315	-0.119	-0.71	-.898(*)	.975(**)	.994(**)
	CO	-0.301	-0.678	-.988(**)	-.986(**)	0.66	0.742	-0.779	-0.438	0.216	0.516	-.940(**)	-.895(*)

RACES		1500 METER						5000 METER					
	VARIABLES	T3	FT3	T4	TSH	FT4	CO	T3	FT3	T4	TSH	FT4	CO
1500 METER	T3												
	FT3	-0.443											
	T4	0.088	-.932(**)										
	TSH	0.251	0.756	-.942(**)									

	FT4	-0.231	-0.77	.949(**)	-1.000(**)								
	CO	0.316	-.991(**)	.973(**)	-.839(*)	.850(*)							
5000 METE	T3	-0.898(*)	0.792	-0.517	0.2	-0.22	-0.701						
	FT3	-1.000(**)	0.457	-0.103	-0.236	0.216	-0.331	.905(*)					
	T4	-0.793	-0.195	0.537	-0.789	0.776	0.327	0.445	0.783				
	TSH	-0.557	-0.498	0.779	-0.944(**)	.937(**)	0.612	0.135	0.544	.948(**)			
	FT4	-0.089	.932(**)	-1.00(**)	.942(**)	-0.949(**)	-.973(**)	0.518	0.105	-0.536	-0.778		
	CO	0.025	.885(*)	-.99(**)	.974(**)	-.98(**)	-0.94(**)	0.417	-0.01	-0.629	-.844(*)	0.993(**)	

* Significant at 0.05 = 0.811 * Significant at 0.01 = 0.917

Table (3) results revealed existence of statistically significance correlation between competition loadand changes level of thyroid hormone free and associated T3, T4, competition load and cortisol CO and thyrotropin TSH and statistically significant correlation between changes level ofthyroid hormone free and associated T3, T4and cortisol CO and thyrotropin, TSH within track runners (100 m, 400 m, 1500 m, 5000 m) in post-measurement.

Table (4): Correlation coefficient between pre and post measurement in thyroid hormones (associated and free and free t3, t4), cortisol CO and thyrotropin TSH in blood plasma within 100 meter track racers (n = 6)

Statistics / variables		Measurement unit	Post-measurements					
			T3	FT3	T4	TSH	FT4	CO
Pre-measurements	T3	NMOL/L	0.960**	–0.974**	0.958**	0.648	1.000**	0.021
	FT3	NMOL/L	–0.967**	0.951**	–0.968**	–0.948**	–0.849*	0.499
	T4	NMOL/L	0.584	–0.629	0.579	0.042	0.797	0.632
	TSH	NMOL/L	0.861*	–0.831*	0.864*	0.999**	0.673	–0.715
	FT4	NMOL/L	0.547	–0.593	0.541	–0.003	0.769	0.666
	CO	NMOL/L	1.000**	–0.996**	1.000**	0.852*	0.946**	–0.29

* Significant at 0.05 = 0.811; * Significant at 0.01 = 0.917

Table (4) results revealed presence of significant correlation in most moral thyroid hormones, cortisol and thyrotropin between pre and post measurement within 100-meter runners at significance levels (0.05), (0.01).

Table (5): Correlation coefficient between pre and post measurement in thyroid hormones (associated and free and free t3, t4), cortisol CO and thyrotropin TSH in blood plasma within 400 meter track racers (n = 6)

Statistics / variables		Measurement unit	Post-measurements					
			T3	FT3	T4	TSH	FT4	CO
Pre-measurements	T3	NMOL/L	0.74	–0.996**	–0.771	0.318	–0.789	0.331
	FT3	NMOL/L	0.982–**	0.895*	0.328	–0.765	0.355	0.208
	T4	NMOL/L	0.131	0.5	0.963**	0.597	0.955**	0.964–**
	TSH	NMOL/L	0.900*	–0.979**	–0.559	0.573	–0.583	0.051
	FT4	NMOL/L	–0.930**	0.962**	0.496	–0.632	0.521	0.024
	CO	NMOL/L	–0.990**	0.7	0.001	–0.933**	0.03	0.516

* Significant at 0.05 = 0.811 * Significant at 0.01 = 0.917

Table (5) results revealed presence of significant correlation in most moral thyroid hormones, cortisol and thyrotropin between pre and post measurement within 400-meter runners at significance levels (0.05), (0.01).

Table (6): Correlation coefficient between pre and post measurement in thyroid hormones (associated and free and free t3, t4), cortisol CO and thyrotropin TSH in blood plasma within 1500 meter track racers (n = 6)

Statistics / variables		Measurement unit	Post-measurements					
			T3	FT3	T4	TSH	FT4	CO
Pre-measurements	T3	NMOL/L	−0.231	−0.77	0.949**	−1.000**	1.000**	0.850*
	FT3	NMOL/L	−0.443	1.000**	0.932−**	0.756	−0.77	−0.991**
	T4	NMOL/L	−0.558	−0.497	0.778	−0.943**	0.936**	0.611
	TSH	NMOL/L	0.922**	−0.062	−0.305	0.606	−0.59	−0.076
	FT4	NMOL/L	−0.394	−0.649	0.881*	−0.989**	0.985**	0.747
	CO	NMOL/L	0.433	−1.00**	0.936**	−0.763	0.777	0.992**

* Significant at 0.05 = 0.811; * Significant at 0.01 = 0.917

Table (6) results revealed presence of significant correlation in most moral thyroid hormones, cortisol and thyrotropin between pre and post measurement within 1500-meter runners at significance levels (0.05), (0.01).

Table (7):Correlation coefficient between pre and post measurement in thyroid hormones (associated and free and free t3, t4), cortisol CO and thyrotropin TSH in blood plasma within 5000 meter track racers (n = 6)

Statistics / variables		Measurement unit	Post-measurements					
			T3	FT3	T4	TSH	FT4	CO
Pre-measurements	T3	NMOL/L	0.984**	0.966**	0.596	0.308	0.358	0.249
	FT3	NMOL/L	0.906*	1.000**	0.782	0.542	0.107	−0.007
	T4	NMOL/L	0.736	0.954**	0.934**	0.77	−0.198	−0.309
	TSH	NMOL/L	0.749	0.959**	0.927**	0.758	−0.18	−0.291
	FT4	NMOL/L	0.726	0.364	−0.294	−0.584	0.964**	0.928**
	CO	NMOL/L	0.512	0.098	−0.542	−0.782	1.000**	0.994**

* Significant at 0.05 = 0.811 * Significant at 0.01 = 0.917

Table (7) results revealed presence of significant correlation in most moral thyroid hormones, cortisol and thyrotropin between pre and post measurement within 5000-meter runners at significance levels (0.05), (0.01).

Positive correlation in FT3(100 m, 400 m races), at (0.05) significance level; correlation coefficientvalued to (0.893). There was also negative correlation between TSH, and FT3 at (0.01) significance levels, correlation coefficientsvalued to (-0.892). There was also strong positive correlation in T4; correlation coefficient valued to (0.999)at (0.01) significance level, also found positive correlation between T4, and T3, FT4 hormones (0.05)(0.01) significance level, correlation coefficient valued to (0.813) (0.996) respectively. There was positive correlation in TSH hormone at (0.01) significance level,correlation coefficient valued to (0.900). Negative correlation was also found between FT4, TSHat (0.01) significance level, correlation coefficient valued to (-0.930).

Also found negative correlation in CO hormone at (0.01) significance level,correlation coefficient valued to (-0.935). There was negative correlation between Co, TSH at (0.01) significance level,correlation coefficient valued to (-0.990). There was also positive correlation between CO, FT3at (0.01) significance level,correlation coefficient valued to (0.991)

Between (100 m), (1500 m)races there was negative correlation between T3, and T4, FT4 at (0.01) significance level,correlation coefficient valued to (-0.936) (-0.951) respectively. There was also positive correlation between FT3, and T3, T4, FT4 at (0.01) significance level, correlation coefficient valued to (0.946) (0.945) (0.929) respectively. There was negative correlation betweenFT4 and T4, FT4 at (0.05) significance level, correlation coefficients valued to (-0.862) (-0.884) respectively.

Between (100 m), (5000 m) races there was positive correlation in T3 at (0.05) significance level, correlation coefficient valued to (0.875). There was also positive correlation between T3, and TSH, CO at (0.01) significance level, correlation coefficient valued to (0.951) (0.982) respectively. There was negative correlation betweenT3 and FT3 at (0.05)

significance level, correlation coefficient valued to (-0.999).

Negative correlation was also found in FT3 at (0.01) significance level,correlation coefficient valued to (-0.976). There was also positive correlation between FT3, and TSH, CO at (0.01) (0.05) significance level, correlation coefficient valued to (0.988) (0.901) respectively. There was negative correlation betweenT4 and FT3 at (0.05) significance level, correlation coefficient valued to (-0.864). There was positive correlation between T4, TSH at (0.01) significance level, correlation coefficient valued to (0.968)

Positive correlation was also found in TSH at (0.01) significance level,correlation coefficient valued to (0.973). There was negative correlation between FT3, and TSH at (0.05) significance level, correlation coefficient valued to (-0.874) There was also positive correlation between FT4, and T3, T4, FT4 at (0.05) (0.01) significance level, correlation coefficients valued to (0.908) (0.974) (0.962) respectively. There was also positive correlation between CO, and T4, FT4 at (0.01) significance level, correlation coefficient valued to (0.999) (1.00) respectively.

Between 400 m, 1500 m races positive correlation found in T3 at (0.05) significance correlation coefficient valued to (0.846).Negative correlation also found between T3, T4 at (0.1) significance level, correlation coefficient value to (-0.921) **.

Positive correlation has been found between FT3, T4 at (0.01)significance level, correlation coefficient valued to (0.958). Positive correlation also found between T4, and T3, TSH hormonesat (0.01), (0.05) significance levels.correlation coefficient valued to (0.797) (0.882) respectively. Negative correlation also found between T4, FT4 at (0.05) significancelevel, correlation coefficient valued to (-0.845). Positivecorrelation between TSH and FT3, FT4, CO hormones at (0.01), (0.05)significance levels, correlation coefficient valued to (0.986), (1.00), (0.877) respectively,Negative correlation also found between TSH and T3, TSH at (0.01) significance level, correlation coefficient valued to (-0.930) (-0.996) respectively. Positive correlation also found between FT4 hormones at (0.05) significance level, correlation coefficient valued to (0.924). Negative correlation found between FT4, T4 at (0.05) significance level, correlation coefficient valued to (-0.840). Negative correlation found between CO, T4 at (0.01) significance level.correlation coefficient valued to (-0.961).

Between 400 meters and 5000 meters races Negative correlation found between T3 and FT3, CO at (0.05), (0.01) significance level, correlation coefficient valued to (-0.875) * (-0.985) respectively. Negative correlation also found between FT3, TSH at (0.05) significance level, correlation coefficient valued to(0.875). Negative correlation also found between T4, and FT3, FT4, CO at (0.01) significance level, correlation coefficient valued to(-0.998) (-0.992) (-0.924) respectively. Positive correlation also found between T4 and T3, TSH at (0.05), (0.01) significance levels, correlation coefficient valued to(0.884, (0.931). positive correlation also found between TSH and T3, TSH at a significance level (0.05), (0.01). correlation coefficient valued to(0.875) (0.976) respectively. Positive correlation also found between FT4, T4 at (0.01) significance level, correlation coefficient valued to (0.982). positive correlation also found between CO, T4 at (0.01) significance level, correlation coefficient valued to (0.996).

Between 1500 meters 5000 meters races; Negative correlation has been found between FT3, TSH at (0.05) significance level, correlation coefficient valued to(-0.915).Negative correlation also found between T4, TSH at (0.1) significance level, correlation coefficient valued to (-0.994). Negative correlation also found in TSH hormone at (0.01) significance level,correlation coefficient valued to (-0.992). Negative correlation also found between FT4 and T3, CO at (0.05), (0.01) significance level. correlation coefficient valued to (-0.831) (-0.996) respectively, Positive correlation also found between FT4, FT4 at (0.01) significance level, correlation coefficient valued to (0.995). Negative correlationalso found between CO and T3, CO at (0.01) significance level, correlation coefficient valued to(-0.951), (-0.934) respectively.Positive correlation also found between CO, FT3 at (0.01) significance level, correlation coefficient valued to(0.930).

Table (3) shows the simple correlation matrix between competition load and change level of thyroid hormone(associated and Free T4 & T3), cortisol (CO) and thyrotropin (TSH) in blood plasma for track racers (100 m, 400 m, 1500 m 5000 m) in post-measurement (immediately after race) and its results reveal presence of correlation between some biochemical variables in post-measurement as follows:

In 100 meters race negative correlation found between FT3, T3 at (0.01) significance level, correlation coefficient valued to (-0.998), Complete positive correlation perfect also found between T3, T4 at (0.01) significance level, correlation coefficient valued to (1.00). Negative correlation also found between T4, FT4 at (0.01) significance level, correlation coefficient valued to(-0.998).Positive correlation also found between TSH and T3, T4 at

(0.05) significance level, correlation coefficient valued to (0.836) (0.839) respectively. Positive correlation also found between FT4 and T3, T4 at (0.01) significance level, correlation coefficient valued to (0.956), (0.954) respectively. Negative correlation also found between FT4, FT3 at (0.01) significance level, correlation coefficient valued to(-0.971).

In 400 meters race positive correlation found between TSH, T3 at (0.05) significance level, correlation coefficient valued to (0.873).

Complete positive correlation also found between FT4, T4 at (0.01) significance level, correlation coefficient valued to(1.00). Negative correlation also found between CO and T4, FT4 at (0.05) significance level, correlation coefficient valued to (-0.856) (-0.841) respectively

In 1500-meter race negative correlation found between FT3, and T4, CO at (0.01) significance level, correlation coefficient valued to(-0.932) (-0.991)respectively.Negative correlation also found between T4, TSH at (0.01) significance level, correlation coefficient valued to (0.942).Positive correlation also found between T4 and FT4, CO at (0.01) significance level, correlation coefficient valued to(0.494) (0.973) respectively.There was negative correlation between TSH and FT4, CO at (0.01) (0.05) significance level, correlation coefficient valued to (-1.00) (-0.839) respectively.Positive correlation also found between FT4, CO at (0.05) significance level, correlation coefficient valued to(0.850).

In the 5,000 meter race positive correlation found between T3, T4 at (0.05) significance level, correlation coefficient valued to(0.905).Positive correlation also found between T4, TSH at (0.01) significance level, correlation coefficient valued to(0.948)

Negative correlation also found between TSH, CO at (0.05) significance level, correlation coefficient valued to(-0.844).Positive correlation also found between FT4, CO at (0.01) significance level, correlation coefficient valued to(0.993).

It was also revealed existence of correlation between the four races (100 m, 400 m, 1500 m, 5000 m) in post-measurement between thyroid hormones (associated and free T3, T4) cortisol CO and thyrotropin TSH in blood plasma. It was found correlation between 100 m, 400 mraces, as follows:

Positive correlation was found in T3 hormone in (100 meters, 400 meters) races at (0.05) significance level, correlation coefficient valued to(0.861). Positive correlation found between T3, and T4, TSH at (0.05), (0.01) significance level, correlation coefficient valued to(0.864), (0.999).Negative correlation also found between T3, FT3 at (0.05) significance level, correlation coefficient valued to(-0.831).Positive correlation also found between FT3, CO at (0.01) significance level, correlation coefficient valued to (0.993). Negative correlation also found between FT3, TSH at (0.05) significance level, correlation coefficient valued to (-0.821). Positive correlation was found between TSH and T3, T4, TSH, FT4 at (0.01) (0.05) significance level, correlation coefficients valued to (1.00) (1.00) (0.849) (0.948) respectively. Negative correlationalso found between FT3, TSH at (0.05) significance level, correlation coefficient valued to (-0.997).

Positive correlation also found between CO, FT3 at (0.05) significance level, correlation coefficient valued to (0.836). Negative correlation also found between CO, FT4 at (0.01) significance level, correlation coefficient valued to (-0.944).

Between (100 m), (1500 m) racespositive correlation between T3, FT3 at (0.05) significance level, correlation coefficient valued to (0.817). Negative correlation found in T3 at (0.05) significance level, correlation coefficient valued to(-0.879). Negative correlation also found in FT3 at (0.05) significance level, correlation coefficient valued to (-0.848). Positive correlation also found between FT3, T3 at (0.05) significance level, correlation coefficient valued to(0.851)

Positive correlation also found between T4, FT3 at (0.05) significance level, correlation coefficient valued to(0.813).Negative correlationalso found between T4, T3 at (0.05) significance level, correlation coefficient valued to(-0.882)

Negative correlation also found between TSH, T3 at (0.01) significance level, correlation coefficient valued to(-0.966).Positive correlation was found a between FT4, FT3 at (0.01) significance level, correlation coefficient valued to(0.951).Negative correlation also found between FT4, CO at (0.05) significance level, correlation coefficient valued to(-0.864). Positive correlation also found between CO, TSH at (0.05) significance level, correlation coefficient valued to (0.874). Negative correlation also found between CO, FT4 at (0.05) significance level, correlation coefficient valued to(-0.864).

Between 100 meters and 5000 meters races positive correlation in T3 hormone at (0.01) significance level, correlation coefficient valued to(0.999).Positive correlation also found between T3, FT3 at (0.05) significance level, correlation coefficient valued to(0.886). Negative correlation also found between FT3, and T3, FT3 at (0.01), (0.05) significance level,correlation coefficient valued to (-0.995) (-0.0859) respectively. Positive correlation also found between T4, and T3, FT3 at (0.01), (0.05) significance level, correlation coefficient valued to (0.999) (0.889)

respectively.Positive correlation also found between TSH, and T3, FT3, T4 at (0.01) (0.05) significance level, correlation coefficients valued to (0.858) (0.995) (0.842) respectively.

Positive correlation also found between FT4, T3 at (0.01) significance level, correlation coefficient valued to (0.942). Negative correlation also found between CO and T4, TSH at (0.01) significance level, correlation coefficient valued to (-0.988) (-0.986) respectively.

Between 400 meter and 1500 meter races negative correlation has been found in T3 at (0.01) significance level, correlation coefficient valued to(-0.999).Negative correlationalso found between T4 and T4, FT4, CO at (0.05), (0.01)significance level, correlation coefficient, valued to(-0.981) (-0.992) (-0.910) respectively. Positive correlation also found between T4 and FT3, TSH at (0.05) (0.01) significance level, correlation coefficient valued to(0.845) (0.898) respectively.

There were also negative correlation between TSH and T3 at (0.05) significance level, correlation coefficient valued to (-0.891). there were also negative correlation between FT4 and T4, FT4, CO at (0.01) significance level, correlation coefficient valued to (-0.975), (-0.995) (-0.898) respectively. Positive correlation also found between FT4, TSH at (0.05) (0.01) significance level, correlation coefficient valued to (0.829) (0.993).Positive correlation also found between T4, CO at (0.01) significance level, correlation coefficient valued to(0.940) (0.993) respectively. Negative correlation also found between CO, FT3 at (0.01) significance level, correlation coefficient valued to (-1.00).

Between 400 meters and 5000 meters races positive correlation has been found between T3, and T3, T3, FT3, T4 at (0.05), (0.01) significance level, correlation coefficient valued to (0.882) (0.999), (0.815) respectively.Negative correlation found between FT3, and T4, TSH at (0.01) significance level,correlation coefficient valued to (-0.999) (-0.959) respectively.Positive correlation also found between T4 and FT4, CO at (0.01) significance level, correlation coefficient valued to(0.981), (0.997) respectively.Negative correlationalso found between T4, TSH at (0.05) significance level, correlation coefficientsvalued to(-0.885).

Positive correlation also found between TSH and T3, FT3 at (0.05), (0.01) significance level,correlation coefficient valued to(1.00) (0.898) respectively.Positive correlation also found between FT4, CO at (0.01) significance level, correlation coefficient valued to(0.975) (0.994) respectively. Negative correlationalso found between FT4, TSH at (0.05) significance level, correlation coefficient valued to(-0.898).Negative correlationalso found between CO and FT4, CO at (0.05) (0.01) significance level,correlation coefficient valued to(-0.940) (-0.895) respectively.

Between 1500 meters and 5000 meters races negative correlation has been found in T3 hormone at (0.05) significance level, correlation coefficient valued to(-0.898). Negative correlationalso found between FT3, T3 at (0.01) significance level, correlation coefficient valued to (-1.00).Negative correlationalso found in TSH at (0.01) significance level, correlation coefficient valued to (-0.944).Positive correlation also found between TSH, FT4 at (0.01) significance level, correlation coefficient valued to (0.937). Negative correlation found between FT4 and nT4, FT4, CO at (0.01) significance level, correlation coefficient valued to (-0.99), (-0.98) (-0.94) respectively.Positive correlation also found between CO and FT3, TSH at (0.01)(0.05) significance level, correlation coefficient valued to (0.885), (0.974) respectively

Table (4) shows Correlation coefficient between pre and post measurement in thyroid hormones (associated and free and free t3, t4), cortisol CO and thyrotropin TSH in blood plasma within 100 meter track racers and its results reveal that there were correlation between pre and post measurements in most variables, where there were positive correlation at (0.01) significance level between pre and post measurements of T3, correlation coefficient valued to (0.960). There were also positive correlations between T3 and T4, FT4 in post-measurement at (0.01) significance level, correlation coefficients valued to (0.958), (1.00) respectively. There was negative correlation between pre-T3 and post FT3, correlation coefficient valued to (-0.974).

Negative correlation found between pre-FT3 and T3, T4, TSH, FT4 at (0.01) (0.05) significance level, correlation coefficients valued to (-0.967) (-0.968) (-0.948), (-0.849) respectively. Positive correlation found same hormone pre and post measurements at a (0.01) significance level, correlation coefficient valued to (0.951).

Positive correlation also found between pre-TSH measurement and T3, T4, TSH at (0.05), (0.01) significance level, correlation coefficient valued to (0.861) (0.864) (0.999) respectively. Negative correlation between pre-TSH and post-FT3 at (0.05) significance level, correlation coefficient valued to (-0.831). There were also positive correlations between pre-CO and T3, T4, TSH, T4, correlation coefficient valued to (1.50), (1.00), (0.852), (0.946) respectively. Negative correlation between pre- CO and FT3, at (0.01) significance level, correlation coefficient valued to (-0.996).

Table (5) shows Correlation coefficient between pre and post measurement in thyroid hormones

(associated and free and free t3, t4), cortisol CO and thyrotropin TSH in blood plasma within 400 meter track racers and its results reveal that there were correlation between pre and post measurements in most variables, where there were negative correlation at (0.01) significance level between pre and post measurements of T3, correlation coefficient valued to (-0.996). There was also negative correlation between FT3 and T3, at (0.01) significance level, correlation coefficients valued to (-0.982). There was positive correlation between preand post FT3 at (0.05) significance level, correlation coefficient valued to (0.895). There were also positive correlations between pre-T4 and T4, FT4 at (0.01) significance level, correlation coefficients valued to (0.963) (0.955) respectively. There was also negative correlation between pre-T4 and post-CO at (0.01) significance level, correlation coefficients valued to (-0.964). There was also positive correlation between pre-TSH and T3 at (0.05) significance level, correlation coefficient valued to (0.90). There was also positive correlation between FT4 and FT3 at (0.01) significance level, correlation coefficient valued to (0.962). There was also negative relationship between FT4 and T3 at (0.01) significance level, correlation coefficient valued to (-0.930). Negative correlationsalso found between pre-CO and post-T3, post-TSH at (0.01) significance level, correlation coefficients valued to (-0.990) (-0.993) respectively.

Table (6) shows Correlation coefficient between pre and post measurement in thyroid hormones (associated and free and free t3, t4), cortisol CO and thyrotropin TSH in blood plasma within 1500 meter track racers and its results reveal that there were correlation between pre and post measurements in most variables, where there were positive correlations at (0.01) (0.05) significance levels between pre-T3 and post- T4, FT4, CO, correlation coefficient valued to (0.949) (1.00) (0.850) respectively. There was also negative correlation between T3 and TSH, at (0.01) significance level, correlation coefficients valued to (1.00). There was positive correlation between T4, and FT4 at (0.01) significance level, correlation coefficient valued to (0.936). There were also negative correlations between T4 and TSH at (0.01) significance level, correlation coefficients valued to (-0.943). There was also positive correlation between pre-TSH and post-T3 at (0.01) significance level, correlation coefficients valued to (0.922). There was also negative correlation between pre-FT4and TSH at (0.01) significance level, correlation coefficient valued to (-0.989). There was also positive correlation between FT4 and T4 at (0.05) significance level, correlation coefficient valued to (0.881). There were also positive correlations between pre-CO and post T4, CO at (0.01) significance level, correlation coefficient valued to (0.936) (992)respectively. Negative correlationsalso found between CO and FT3 at (0.01) significance level, correlation coefficient valued to (1.00).

Table (7) shows Correlation coefficient between pre and post measurement in thyroid hormones (associated and free and free t3, t4), cortisol CO and thyrotropin TSH in blood plasma within 5000 meter track racers and its results reveal that there were correlation between pre and post measurements in most variables, where there was positive correlations at (0.01) significance level between pre-T3 and post-T3, FT3, correlation coefficient valued to (0.984) (0.966) respectively. There was also positive correlation between pre-FT3 and post T3, FT3 at (0.01) (0.05) significance levels, correlation coefficients valued to (0.954) (0.934) respectively. There were positive correlation between pre-TSH, and post-FT3, TSH at (0.01) significance level, correlation coefficient valued to (0.959) (0.927) respectively. There were also positive correlations between pre-FT4 and post-FT4, CO at (0.01) significance level, correlation coefficients valued to (1.00) (0.994).

Through previous presentation of tables (2, 3, 4, 5, 6, 7), it is clear from its results existence of correlation between most research variables in all competitions (100 meters, 400 meters, 1500 meters, 5000 meters), according to competition load. Resultsalso revealed changes in the relationship of free and associated thyroid hormones, cortisol in the blood plasma affected by competition load. Researchers return this changes in relationship between hormones and competition load whether before or after competition or correlation between hormones before and after competition to hormone system adaptation occur as result of sports training and according to the nature and type of training load.These adaptations have a great impact in influencing hormone functions changes, where these adaptations happen due to long exercises, whether aerobic, anaerobic or mixed, which in turn affects hormone work nature. The matter which explained the existence of positive or negative correlation for thyroid hormones or cortisol hormone affected by competition load and this is consistent with what mentioned in references and studies that pituitary hormone affect by different pressures on body which in turn control thyroid and adrenal glands activity and also the adrenal glands where these glands play an important role in metabolic processes. (Dicken Weatherby, 2009).

Conclusions:

From data reality and within the farm of statistical work done and limited by research sample; researchers conclude the following:

1- There is statistically significant correlation between competition load and changes in associated and free thyroid hormones (T3 & T4), Cortisol, thyrotropin TSH in blood plasma in (100 m, 400 m, 1500m 5000 m) in pre-measurements, most important results are as follow:

- Existence of positive correlation in T3 hormone between (100 meters, 5,000 meters) races at (0.05) significance level, correlation coefficient valued to (0.875).
- Existence of positive correlation in FT3 hormone between (100 meters, 400 meters) racesat (0.05) significance level, correlation coefficient valued to(0.893) and negative correlation between (100 meters, 5000 meters) races at (0.01) significance level, correlation coefficient valued to(-0.976).
- Existence of positive correlation in T4 hormone between (100 meters, 400 meters) at (0.01) significance level, correlation coefficient valued to(0.999)
- Existence of positive correlation in TSH hormone between (100 meters, 400 meters5000 meters) races,negative correlation between (100 meters, 1500 meters) valued toat (0.01) significance level, correlation coefficient valued to (0.900), (0.973), (-.936).respectively
- Existence of positive correlation in FT4 hormone between (100 meters, 5000 meters) races and negative correlation between (100 meters, 1500 meters) racesat (0.05), (0.01) significance level, correlation coefficient valued to (0.884), (-0.962)respectively.
- Existence of negative correlation in CO hormone between (100 meters, 400 meters) racesat (0.01) significance level, correlation coefficient valued to(-0.935).
- Existence of positive correlation in T3 hormone between (400 meters, 1,500 meters) races at (0.05) significance level, correlation coefficient valued to(0.846).
- Existence of negative correlation in FT3 hormone between (400 meters, 5,000 meters) racesat (0.01) significance level, correlation coefficient valued to(-0.970).
- Existence of positive correlation in TSH hormone between (400 meters, 5000 meters) races,and negative correlation between (400 meters, 1500 meters) racesat (0.01) significance level, correlation coefficient valued to (0.976), (-0.996) respectively.
- Existence of negative correlation in TSH hormone between (1500 meters, 5000 meters) race at a (0.01) significance level,correlation coefficient valued to(-0.992).
- Existence of negative correlation in CO hormone between (1500 meters, 5000 meters) racesat (0.01) significance level, correlation coefficient valued to(-0.924).

2- There is statistically significant correlation between competition load and changes in associated and free thyroid hormones (T3 & T4), Cortisol, thyrotropin TSH in blood plasma in (100 m, 400 m, 1500m 5000 m) in post-measurements (immediately after competition), most important results are as follow:

- Existence of positive correlation in T3 hormone between 100 meters, 400 meters, 5000 meters and negative correlation between 100 meters, 1500 meters at (0.05), (0.01) significance levels and correlation coefficientvalued to (0.861), (-0.879), (0.999)respectively.
- Existence of negative correlation in FT3 hormone between (100 meters, 1500 meters, 5000 meters) race at (0.05) significance level, correlation coefficient valued to (-0.848), (- 0.859) respectively.
- Existence of positive correlation in T3 between hormone (400 meters, 5000 meters) races at (0.05) significance level, correlation coefficient valued to(0.882) and negative correlation between 400 meters, 1500 meters at (0.01)significance level, correlation coefficient valued to(- 0.999).
- Existence of negative correlation in T4 hormone (400 meters, 1,500 meters) races at (0.01) significance level, correlation coefficient valued to(- 0.981).
- Existence of negative correlation in FT4 hormone between (400 meters, 5,000 meters) racesat (0.01) significance level, correlation coefficient valued to(- 0.940).
- Existence of negative correlation in T3 hormone between (1500 meters, 5000 meters) races at (0.05) significance level, correlation coefficient valued to(- 0.898).
- Existence of negative correlation in TSH, FT4, CO hormones between (1500 meters, 5000 meters) racesat (0.01) significance levels, correlation coefficient valued to (-.944), (-.949), (-.940) respectively.

3- There is statistically significant correlation between competition load and changes in associated and free thyroid hormones (T3 & T4), Cortisol, thyrotropin TSH in blood plasma in (100 m, 400 m, 1500m 5000 m) between pres and post-measurements (immediately after competition), most important results are as follow:

- In 100 meters race there were positive correlation in (T3, FT3, TSH) at (0.05)significant levels, correlation coefficients valued to (0.960) (0.951) (0.999) respectively
- In 400 meter there were positive relationship between in (FT3, T4) at (0.05) significance level, correlation coefficient valued to(0.895), (0.963)respectively
- In 1500 meters there were positive correlationsin (FT3, FT4, CO) hormones at (0.01) significance level, correlation coefficient valued to (1.00), (0.985), (0.992) respectively
- In 5000 meters positive correlation found in (T3, FT3, T4, FT4, CO) hormones at (0.01) significance level, correlation coefficient valued to (0.984), (1.00), (0.934), (0.994).Respectively

4- Competition load led to some changes in thyroid hormones and, adrenal gland cortisol hormone.

- Recommendations:

Based on previous conclusions, statistical results, limited by research sample researchers recommend the following:

1- It is necessary to give concern to nature of relations between activity of associated and free thyroid hormones T3, and T4 and cortisol CO and hormone thyrotropin TSH accordance to competition load.
2- It is necessary to focus on training methods according to energy production, which in turn improves thyroid, and adrenal hormones (energy hormones) and pituitary gland hormone.
3- It is necessary to use thyroid, and adrenal hormones (energy hormones) and pituitary gland hormone as indicators to evaluate effectiveness of training programs according to energy production systems.
4- Conducting periodical tests for thyroid, and adrenal hormones (energy hormones) and pituitary gland hormoneto identify improvement extent in athletes' biological efficiency level
5- Further scientific research and studies related to thyroid, and adrenal hormones (energy hormones) and pituitary gland hormoneto standardize functional efficiency and initial and gradual selection process in accordance with nature and characteristics of competition load.

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