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The effect of using ultraviolet B (UVB) technology on the development of recovery

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Abstract

This study aimed to draw attention to the effective role played by ultraviolet radiation in developing aerobic capacity and developing recovery in athletes by knowing the extent of its effect on the cardiovascular system, the respiratory system and the neuromuscular system, where these rays were used as a light spectrum that athletes are exposed to during sleeping hours. In this study, we used the experimental approach on a sample of (08) eight half-long distance runners of the older class, divided into two groups (control, experimental), and tests were conducted on them (Ruffier test, Vameval test, measurements of blood oxygen transfer rate, systolic and diastolic blood pressure, resting heart rate, muscle lactate concentration), where the interval between the pre and post measurement was 19 weeks, with the obligatory use of an ultraviolet lamp in the bedroom during this period. Through the results of this study, we concluded that these rays had a significant effect on blood pressure and resting pulse, and did not affect the maximum aerobic speed and the concentration of lactic acid. Positive results can be linked to the effective role of vitamin D, which stimulates the absorption of phosphorus and magnesium, controlling blood pressure and clogged arteries, and adjusting calcium levels in the body, which reduces high blood pressure and balances the level of acidity in the body. This is evidenced by the presence of vitamin D receptors. at the lung level. Therefore, we recommend using this method to improve the functional performance of the cardiovascular system in athletes.

1. Introduction

Ultraviolet radiation is an electromagnetic wave with a wavelength shorter than visible light but longer than X-rays. It is called “ultraviolet” because the wavelength of the violet color is the shortest among the colors of the spectrum. Its wavelength ranges from 10-400 nanometers, and its energy ranges from 3-124 electron volts. Ultraviolet rays are part of the components of the sun's rays and are emitted by electrical arcing or black light, and as they are ionizing rays (separating electrons from their atoms) they may cause a chemical reaction, and make many materials glow or fluorescent, and many people have realized the effect of ultraviolet radiation on the body causing Cases of sunstroke, but the spectrum of those rays has other effects that may be beneficial or harmful to human health (Hockberger, 2002). The discovery of ultraviolet rays was related to the scientific observation that silver salts darken after exposure to sunlight. In 1801, the physicist Ritter noted that invisible rays, whose wavelength is shorter than the violet color, which is the end of the visible spectrum, are particularly successful in darkening the color of silver leaf. Saturated with chloride, he named them oxidizing rays to emphasize their chemical reaction and to distinguish them from the hot rays that are at the other end of the spectrum. The name chemical rays were adopted shortly thereafter and this name remained in use during the nineteenth century. In the end, the expressions chemical rays and hot rays fell out of use, and the expressions were used ultraviolet and infrared rays, respectively. Ultraviolet radiation below 200 nanometers is called vacuum because air absorbs it strongly. It was discovered by the German physicist Chouman in 1893 (Lyman, 1914). Earth's atmosphere significantly modulates incoming solar radiation due to absorption and scattering by oxygen gas, water vapor, carbon dioxide, ozone, water droplets, dust particles, and other components of the biosphere by human and volcanic activities. A linear correlation was found between global and global solar UV radiation, particularly in the region of moderate to low global values of solar energy (Koronakis et al., 2002,36). The main natural source of vitamin D is the synthesis of cholecalciferol in the lower layers of the epidermis through a chemical reaction that depends on exposure to sunlight specifically (MacDonal, 2019). The main positive effect of UVB exposure is that it It helps to produce vitamin D in the skin. Estimates say that there are tens of thousands of people who die of cancer annually in the United States, and the reason is a lack of vitamin D in the body (Grant, 2002, 1867). Vitamin D is a group of fat-soluble secosteroids responsible

for increasing intestinal absorption of calcium, magnesium and phosphate and many other biological effects (Bikle & Daniel, 2014). Calcium is an essential element that the body needs in large amounts. Ca2+ improves the health of the muscular, circulatory and digestive systems. It is indispensable for bone formation and supports the synthesis and function of blood cells, for example it regulates muscle contraction, nerve transmission and blood clotting. As a result, it regulates calcium levels inside and outside the cell. tightly by the body. Calcium can play these roles because Ca2+ ions form stable coordination complexes with many organic compounds, especially proteins. It also forms compounds with a variety of soluble compounds, and this allows the formation of the skeleton, and magnesium is one of the important mineral nutrients for the body, and it is found in the form of a positively charged diion 2 + Mg, and it is one of the essential nutrients for life (Hluchan & Pomerantz, 2006, 94), where magnesium plays a role in stabilizing and stabilizing polyphosphate compounds in cells, including those related to the synthesis of RNA and deoxyribonucleic acid (DNA), and it also needs adenosine triphosphate (ATP), which is the primary energy source in cells. , to bind with the magnesium ion to become effective and active, and it was noted that the ATP molecule is usually found in the form of a chelate with the magnesium ion (Romani & Anderia, 2013). Modern sports training science depends on other sciences that serve sports performance, and among the factors that helped develop sports performance and rationing training loads is interest in recovery or recovery after physical effort (Ghazi, 2001), and to ensure the improvement of the player's physical and functional capabilities, it is necessary to take care of the recovery process In this stage, phosphate and glycogen stores are replenished in the muscles, and hemoglobin is linked to oxygen and lactic acid is removed from the muscles and blood (Al-Din, 2006, 191). This is what made us discuss in our study the effect of ultraviolet radiation on the development of aerobic capacity as well as recovery in athletes, based on several characteristics and vital indicators related to the cardiovascular, respiratory and muscular systems. In order to facilitate the research process, it was divided into three partial questions:

- What is the effect of using ultraviolet radiation on improving the efficiency of the cardiovascular system among athletes?
- What is the effect of using ultraviolet radiation on improving the efficiency of the respiratory system in athletes?

- What is the effect of using ultraviolet radiation on improving the efficiency of the neuromuscular system in athletes?

2. Method and Materials

We conducted a prospective study on a sample of (03) three athletes from the same team who were deliberately chosen and then excluded from the basic course, where the experimental protocol was applied to them, which is the measurement of the resting heartbeat by a smart pro M4 cardiac watch, the measurement of systolic and diastolic blood pressure using a Beurer blood pressure monitor, measuring the oxygen level in the blood with an Alecto oximeter, and measuring the lactic acid level in the blood with a LactateScout4 lactatometer, then performing the RUFFIER test and the VAMEVAL test, taking into account that there was a time period of (1h) one hour between the two tests. aforementioned, and then re-conducted after a period of time of (24h), a full day in which the three athletes were forced to rest completely. Then the validity and reliability of each of the two tests and the measured characteristics were measured.

Table N°01 shows results of Pearson's test for validity and reliability

	Lactate Mg/Dl	FC (B/min)	Rf	VO_{2max} (ml.min.kg)	VMA (km/h)	T (mmHG)	
						Sys	Diasys
Val	0.972	0.866	0.994	0.999	0.913	0.982	1
Rel	0.985	0.930	0.996	0.999	0.955	0.990	1

Through table N°01, we note that all stability values are greater than (0.80), and this is evidence of the stability of the tests and the measured features, and the validity is the square root of the stability. All of its values shown in the table are close to or equal to one (01), which confirms the validity of the tools and tests used in the experiment.

The main study was on a sample consisting of (08) eight half-distance runners (less than 21 years old) for the Amal Youth Club, Saleh Bay, regular-trained males. homogeneity.

Table N°02-a shows the results of the Levene test for homogeneity of variance based on the arithmetic mean

		$\overline{X}_1$	$\overline{X}_2$	df_1	df_2	Levene	sig	obs
age		18.5	19	1	6	0,429	0.537	Homogenios
weight		62.5	60.5			0,033	0.862	Homogenios
height		180.25	176.85			0,364	0.569	Homogenios
sleep		8.25	7.75			1,6	0.253	Homogenios
VMA		15.87	16.12			0,158	0.705	Homogenios
Ruffier test		6.67	6.57			0,176	0.689	Homogenios
Rest pulse		62	62			0,429	0.537	Homogenios
Oxigyn saturation		98.25	98.5			1	0.356	Homogenios
Lactate concentration		15	15.175			0,160	0.703	Homogenios
Blood tension	**Syst**	82	82			1,929	0.214	Homogenios
	Dia	125.25	124			5,357	0.06	Homogenios

Table N°02-b shows the normal distribution of the results of the tests conducted on the sample

ChapiroWilk test (pre-test)								
		sig	**df**	**calc**	**sig**	**Distribution**	**measures**
weight		0.05	8	0.954	0.657	Normal	**Athro**
height				0.978	0.953	Normal	
VMA				0.966	0.867	Normal	**Physio**
Rest pulse				0.885	0.21	Normal	
Lactate concentration				0.954	0.75	Normal	
Blood tension	**Syst**			0.958	0.792	Normal	
	Dia			0.358	0.911	Normal	
Chapiro Wilk test (square root with arithmetic mean)							
Age		0.05	1	6	0.42	Normal	**Anthro**
Sleep					0.29	Normal	
Ruffier test					0.707	Normal	**Physio**
Oxigyn saturation					0.356	Normal	
Chapiro Wilk test (The normal distribution of data in pre and post measurement)							
		sig	df	pre		post		**Obs**
				calc	Sig sw	calc	Sig sw	**All values are completely greater than the 0.05 level of significance, as they follow the normal normal distribution**
control	**VMA**	0.05	4	**0.982**	**0.911**	**0.945**	**0.683**	
	Rest pulse			**0.882**	**0.348**	**0.963**	**0.798**	
	Lactate concentration			**0.964**	**0.803**	**0.882**	**0.345**	
	Ruffier test			**0.814**	**0.129**	**0.768**	**0.056**	
	Oxigyn saturation			**0.971**	**0.850**	**0.945**	**0.683**	
	Blood tension **Syst**			**0.971**	**0.850**	**0.945**	**0.683**	
	Dia			**0.971**	**0.850**	**0.916**	**0.513**	
experimental	**VMA**			**0.980**	**0.900**	**0.920**	**0.538**	
	Rest pulse			**0.773**	**0.62**	**0.808**	**0.117**	
	Lactate concentration			**0.975**	**0.874**	**0.908**	**0.472**	
	Ruffier test			**0.905**	**0.458**	**0.927**	**0.578**	
	Oxigyn saturation			**0.945**	**0.683**	**0.863**	**0.272**	
	Blood tension **Syst**			**0.945**	**0.683**	**0.971**	**0.850**	
	Dia			**0.946**	**0.689**	**0.927**	**0.577**	

Through the table, it is clear that all values are completely greater than the level of significance (0.05), and this makes us sure that all values are

distributed normally and that the sample is homogenous, so the Student (T) test can be applied to the sample.

A work team consisting of (05) five individuals was used, where we applied the experimental protocol that was previously explained, and the same process was repeated after a period of time of (19) nineteen weeks, taking into account the use of the experimental group of the ultraviolet lamp in the bedroom throughout the duration of the experiment.

3. Results

1/ Cardiac signs

Table N°03 shows the differences of the pre-measurements of the control and experimental groups with regard to heart indicators

		sig	T calc	T tab	obs
Rest pulse		1	0	1.94	No sign
T	Diasys	0.801	0.264		No sign
	Sys	0.651	0.467		No sign

Through the previous table, we find that all probability values are completely greater than the significance level (0.05), and that all calculated (t) values are completely smaller than the tabular (t) values, which confirms that there are no statistically significant differences between these averages.

Table N°04 shows the differences between the pre and post measurement of the control group with respect to heart indicators

		sig	T calc	T tab	obs
نبض الراحة		0.007	6.789	2.35	sign
T	Diasys	0.032	3.806		sign
	Sys	0.038	3.53		sign

Through the previous table, we can see that all the calculated (t) values are completely greater than the tabular (t) values, and that the value of the significance level is smaller than (0.05), this indicates that there are statistically significant differences in favor of the post-measurement.

2/ Maximum aerobic speed and oxygen concentration in the blood

Table N°05 shows the differences between the pre-measurements of the control and experimental groups regarding the maximum aerobic speed and oxygen concentration in the blood

	sig	T calc	T tab	obs
VMA	0.817	-0.241	1.94	Not sign
Oxygen saturation	0.801	-2.64		Not sign

From the comparison of the results of the previous table, we find that all the probability values are completely greater (0.05), and the calculated (t)

values are completely smaller than the tabular (t) values, which confirms that there are no statistically significant differences between these averages.

Table N°06 shows the differences between the pre and post measurements of the control group regarding maximum aerobic speed and oxygen concentration in the blood

	sig	T calc	T tab	obs
VMA	0.638	-0.522	2.35	Not sign
Oxygen saturation	0.638	-0.522		Not sign

From the comparison of the results of the previous table, we find that all the calculated (t) values are negative and completely less than the tabular (t) value, and the probability values are completely greater than (0.05), and from it we confirm that there are no statistically significant differences between the pre and post measurement of the control group.

Table N°07 shows the differences between the pre and post measurements of the experimental group regarding maximum aerobic speed and oxygen concentration in the blood

	sig	T calc	T tab	obs
VMA	0.103	-2.324	2.35	Not sign
Oxygen saturation	0.058	-3		Not sign

By comparing the results of the previous table, we find that all the calculated (t) values are negative and less than the tabular (t) value, and the probability values are greater than (0.05), which indicates that there are no statistically significant differences for the experimental group.

Table N°08 shows the differences between the pre-measurements of the control and experimental groups related to the Ruffier test and the level of lactic acid in the blood

	sig	T calc	T tab	obs
Ruffier test	0.87	0.171	1.94	Not sign
Lactate concentration	0.81	-0.244		Not sign

Through the previous table, we notice that all the probability values are completely greater than (0.05), and all the calculated (t) values are completely smaller than the tabular (t) value, as well as indicating that there are no statistically significant differences between these averages.

Table N°09 shows the differences between the pre and post measurement of the control sample of the Ruffier test and the level of lactic acid in the blood

	sig	T calc	T tab	obs
Ruffier test	1	0	2.35	Not sign
Lactate concentration	1	0		Not sign

The previous table shows that the probability values are greater than (0.05), and the calculated (t) values are smaller than the tabular (t) value, which indicates that there are no statistically significant differences between the pre and post measurement of the control group.

Table N°10 shows the differences between the pre and post measurement of the experimental sample of the Ruffier test and the level of lactic acid in the blood

	sig	T calc	T tab	obs
Ruffier test	0.012	5.4	2.35	sign
Lactate concentration	0.177	1.75		Not sign

The previous table shows us that the probability value of the Ruffier test is less than (0.05), while the probability value of the concentration of lactic acid in the blood is greater than (0.05). For a lactic acid concentration in the blood greater than the tabular (v) value, This indicates that there are statistically significant differences with regard to Ruffier's test and the absence of statistical significance with regard to the concentration of lactic acid in the blood.

Table N°11 shows the effect size of the pre and post measurement for the experimental group

		Cohen's D test			
		n	T	D	Effect
Ruffier test		4	5.4	2.7	Not strong
Heart pulse			6.789	3.4	
Blood tension	**Dia**		3.806	1.9	
	Sys		3.53	1.76	

Through the previous table, we notice that all values are completely less than (0.5), and this indicates that the weak effect of the independent variable on the dependent variable, which is the retrieval.

4. Discussion

Through the interpretation of the previous results, it is clear to us that the use of ultraviolet radiation improves the efficiency of the cardiovascular system in athletes, but with a weak effect, and this is due to the short period of application of the experiment and opens the way for other studies of a period longer than 19 weeks. The physiological changes of the heart system

can be measured by measuring blood pressure. What Saad El-Din knows: It is the difference between systolic blood pressure and diastolic blood pressure. (Saad El-Din, 2000, 138) 50-90 beats per minute (Aladin & al., 2014, 114). From the analysis of the results of Table (3), we can see that there are no differences between the control and experimental samples, as the calculated T values are completely smaller than the tabular T value, and there are no differences between the pre and post measurements from Table (4) for all indicators of resting heartbeat and blood pressure. systolic and diastolic, where all the calculated T values are smaller than the tabular T values, and from the comparison of the results to Table (5), it is clear that there are differences between the values and their significance in all the measured characteristics of blood pressure and heartbeat, so all the calculated T values are greater than the values of Tabular T and from Table (12) we find that there is a weak effect and this supports the validity of the hypothesis that ultraviolet radiation has an effect on the efficiency of the cardiovascular system.

Through the interpretation of the previous results, it is clear to us that the use of ultraviolet radiation in improving the efficiency of the respiratory system in athletes. It is possible to generalize that all the characteristics related to the functional organs affect, even slightly, the recovery process, which is a physiological and functional state represented in the return of the indicators of the body systems to their normal levels, if closer. What this is, and includes biophysiological processes that occurred in response to the effects of physical load on the body after the performance. (Rafie & Ali, 24, 2008). And Samia Khalil defines it: “The process of restoring and renewing indicators of the functional and psychological state of the various organs of the body after exposure to stress or the impact of performing an activity.”) which inhibits inflammatory responses of the lung, while enhancing innate defense mechanisms against respiratory pathogens. (Dellal, 2013, 161). And from the analysis of the results of tables (06, 07, 08), it is clear that there are no statistically significant differences between the post- and pre-measurement for each of the control and experimental sample in the post-measurement, and this indicates that ultraviolet radiation does not affect the respiratory system from VMA and VO2MAX, as well as the rate of oxygen transport in the blood Ultraviolet radiation does not affect aerobic capacity by a large percentage, and this contradicts what Abdullah Mansouri reached,

whereby both short and long interval training have the ability to develop maximum aerobic speed (Mansouri, 267, 2021).

Through the interpretation of the previous results, it is clear to us that the use of ultraviolet radiation in improving the efficiency of the neuromuscular system in athletes based on muscle fatigue in terms of its effect on the nervous system as the state in which the ability to respond effectively to stimuli or stimuli decreases, and muscle fatigue can be defined as A state of temporary decline in the physical and functional efficiency of the body, which arises as a result of the performance of physical and successive efforts that clearly affect the level of the individual and his ability to continue performing. Training increases the ability of the muscle to store glycogen, as the lack of glycogen determines the ability of the athlete to maintain high-intensity performance, especially during the last periods of the match (Madkhoor, 2011), which stimulates the muscle and the Krebs cycle, from glycolysis to lactic acid resulting from the reaction, where it accumulates in the muscle and the increase in the pool of lactic acid in the muscle resulting from anaerobic glycolysis leads to fatigue. From this excess acid in the muscles and blood. (Salama, 102). Through the results of tables (09, 10, 11) with regard to the percentage of lactic acid, we find that there are no significant differences, which means that ultraviolet radiation does not affect the neuromuscular system, in contrast to what Eid al-Haq concluded in his study that the use of both positive and negative rest in Retrieval, focusing on the positive relief in a large way to get rid of lactic acid. (Bilal & Nagal, 2021, 87).

5. Conclusion

Sunlight is a natural source that has many benefits for humans, and we specialize in its ultraviolet rays, which are a source used by the skin to produce vitamin D with medium spectral length (B). For athletes, any sports or non-athletic person should sit in front of the natural doctor, who is sunlight, even for a quarter of an hour a day, due to the effective role that vitamin D plays in the human body, as it stimulates the absorption of magnesium and phosphate and regulates the proportion of calcium in the blood, which in turn helps in Reducing blood pressure and clogged arteries and protecting against heart disease, The effective role that ultraviolet rays affect urges the actual definition of its benefits, its use in training operations as a device that athletes are exposed to during certain hours of the day, and

attention to the necessity of training in sunlight, with the need to alert it in courses and training seminars related to the field of sports from it or medical.

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