

How to Cite:

Gorgees, S. H. (2022). Comparing the achievement level and some functional variables in a (50m) Freestyle swimming between two different thermal conditions. *International Journal of Health Sciences*, 6(S2), 7407–7426. <https://doi.org/10.53730/ijhs.v6nS2.6863>

Comparing the achievement level and some functional variables in a (50m) freestyle swimming between two different thermal conditions

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Abstract--The research problem revolves around the idea that swimming is practiced in swimming pools and is also practiced in rivers, seas, and lakes. Temperatures are different for each of these places. The ideal air-conditioned pool temperature is (25C), while the temperature of non-conditioned pools and the above-mentioned water bodies vary in temperature with the different weather conditions, the increase in the surface area of the water, and the increase in the depth of the water. Therefore, there must be a difference in the effect of the temperature of each water medium from these media on the functional variables and the level of achievement during the exercise of physical effort. Through the researcher's knowledge of many local and university championships in the field of swimming, the significance of the idea of the present study became clear for the researcher in studying these variables and the changes that occur as a result of the difference in temperatures. The present study aims to identify the differences in the level of achievement in a 50-meter freestyle swimming between two different temperatures. It also aims to identify the differences in some functional variables in a 50-meter freestyle swimming between two different temperatures. The researcher assumes that there are significant differences in the level of achievement in a 50-meter freestyle swimming between two different temperatures. The researcher also assumes that there are significant differences in some functional variables in (50m) freestyle swimming between two different temperatures. In order to verify the hypotheses, the researcher used the descriptive comparative causal approach as it fits the nature of the present study. The research community was chosen deliberately with the (18) players of the Nineveh Province swimming team. The youth category of (12) players was deliberately chosen from this community. The researcher used the arithmetic mean, standard deviation, and T-test for the related samples and the

variation coefficient as statistical means, along with (the SPSS) version (11.0) to statistically process the data. The researcher concluded that there are significant differences in the level of achievement in (50 meters) freestyle swimming in the two thermal conditions in favor of the moderate thermal condition. The researcher also concluded that there are significant differences in the temperature of the center between the two thermal conditions in favor of the moderate thermal condition. She also concluded that there are significant differences in skin temperature between the two thermal conditions in favor of the moderate thermal condition. Other significant differences in systolic blood pressure were found between the two temperature conditions in favor of the low-temperature condition. Besides, it was found that there are significant differences in diastolic blood pressure between the two temperature conditions in favor of the low-temperature condition. There are also significant differences in the number of heartbeats between the two thermal conditions in favor of the moderate thermal condition. Through the conclusions, the researcher recommended the following:- Conducting similar studies that deal with other variables that may affect. - Bearing in mind that training in low temperatures causes blood pressure to rise even more.- Considering that training in low temperatures leads to a lower heart rate.

Keywords---freestyle swimming, achievement level, functional variables.

Introduction

The study of the functional variables of the various organs of the body is one of the things that have preoccupied many researchers over the past long years due to the role that these systems play to bring the athlete to a high degree of physical performance through the integration of the work of the various body systems and organs. The temperature of the water environment plays an important role in its impact on sports achievement. The training process is one of the variables that may be positive sometimes and negative at other times. The increase in participation in sports activities in the water, such as swimming, called for attention to training in cold environments. The heat to which a swimmer is exposed during training or competition when he/she performs different types of effort that may be aerobic, anaerobic, or lactate rises to the point of the problem, leading to a decision based on scientific rules and facts. Swimming is one of the sports that are practiced in different environments. It may be practiced inside closed pools or outdoor pools, such as in short-distance races. It may also be practiced in rivers, seas, and lakes.

One of the studies that examined the effect of different thermal conditions on some physiological variables is a study conducted by (Falk et al. 1995). It tackles the effect of high (35C)° and low (20C) temperature on low (LA) levels during passive and active rest and the absence of an effect of high thermal conditions on finding Significant differences in the level of (LA), heart rate (HR) and

hospitalization compared to the moderate condition of passive rest. From the foregoing, the significance of the present study becomes clear in identifying the number of changes that obtain the functional variables and achievement in swimming when the difference in temperature between closed and open swimming pools.

The Research Problem

It is known that swimming is practiced in swimming pools and is also practiced in rivers, seas, and lakes. The temperatures are different for each of these places. The ideal air-conditioned pool temperature is (25C), while the temperature of non-conditioned pools and water bodies mentioned above varies according to Weather conditions, the increase in the water surface area, and the increase in water depth. Therefore, there must be a difference in the effect of the temperature of each aqueous medium from these media on the functional variables and the level of achievement during the exercise of physical effort. Through the researcher's knowledge of many local and university championships in the field of swimming, the idea of the present study became clear for the researcher in studying these variables and the changes that occur as a result of the difference in temperatures.

The Objectives of the Present Study

- Identifying the differences in the level of achievement in a 50-meter freestyle swimming between two different temperatures.
- Identifying the differences in some functional variables in a 50-meter freestyle swimming between two different temperatures.

The hypotheses

1. There are significant differences in the level of achievement in (50 meters) freestyle swimming between two different temperatures.
2. There are significant differences in some functional variables in (50m) freestyle swimming between two different temperatures.

Research domains

1. The human Domain; Nineveh Province youth team players.
2. The spatial Domain; The indoor swimming pool belonging to the water towers city is located in the bank's neighborhood and the outdoor swimming pool belongs to the same water city.
3. The temporal domain; From 5/12/2018 to 16/12/2018.

Theoretical and similar studies

Theoretical studies

Swimming

Swimming is one of the water sports, without mastering which, other water sports cannot be practiced. It can be practiced by males and females from all age groups. Swimming is one of the popular sports practiced by approximately all people in the world. Therefore, swimming is one of the repetitive and complex bilateral skills. It requires a high degree of agility and neuromuscular coordination in performing special and comprehensive movements for all parts of the body. It requires the distribution of muscular strength to all parts of the body in harmony. In addition, it requires maintaining the horizontal position of the body on the surface of the water, which is all done By controlling the work of the nervous and muscular systems (Al-Ayash, 1989).

Freestyle

Among all other types of swimming (back, chest, and butterfly), freestyle swimming is the fastest type (Ratib, 1984). Distances of freestyle races are (50m, 100m, 200m, 400m, and 1500m) for men and (800m) for women. These are Olympic distances inside swimming pools. The 100meter freestyle swimming is highly dependent on the lactate system because the time of the race distance for this activity is within the control of the aforementioned system.

Among the necessary skills for speed swimmers for a distance of (50) meters, freestyle is a good performance of the swimming method, as well as good starting and rotation. One of the important physiological characteristics that specialized speed swimmers must possess is to increase their muscle strength so that the swimmer can apply more driving power. They should also increase the rate of anaerobic metabolism of energy. Moreover, they should increase the ability of the buffers inside the muscle to the extent that the effect of the lack of pH on the rate of anaerobic metabolism will decrease. The swimmer must bear the increase in carbon dioxide formed in the muscle tissue as a result of the decrease in the number of breathing times in order to increase the rate of speed. Swimmers should reduce the slowdown of the speed of the (50m) Freestyle swimming as a result of taking a breath (Al-Kit, 2005).

Functional Variables

Body center temperature and surface temperature

The temperature of the center is called the internal body temperature. In general, this temperature remains at a constant and natural level for healthy people and during rest. When the center temperature rises, heat loss speed is more than heat formation speed, which results in heat returning to its normal range. But, when the center temperature is less than this level, the speed of heat formation is greater than the speed of its loss until the temperature rises and reaches its normal range. Thus, it is also called the setpoint (Al-Ramadhan, 1992).

The temperature of the body varies according to different areas of the body. The temperature of the mouth is slightly lower than the temperature of the rectum. The liver is the warmest part and the skin is the coldest part (Addai, 1987). The rectal temperature is representative of the temperature of the center of the body. It slightly varies with changes in the ambient temperature. The standard normal value for body center temperature measured orally ranges between (36.7-37) Celsius degrees. Oral temperature is usually 0.5 Celsius degrees lower than rectal temperature, but it is affected by several factors, including hot or cold liquids, smoking, and breathing through the mouth (Ganong, 1981). There are other areas through which it is possible to measure the approximate temperature of the center of the body, including the area under the armpit, as well as the groin area, which is the area separating the thigh and the abdominal wall. The center temperature includes two-thirds of the body mass as it includes the brain, the rib cage organs, the abdominal cavity, and the deep areas of the muscle masses of the limbs. The remaining third of the body represents its surface temperature, which includes the skin, subcutaneous tissues, and shallow areas of muscles, which are affected to some extent by the temperature of the external environment and the amount of clothing worn by the individual. Body surface temperature is between (23-34) Celsius degrees (Al-Hajjar, 1994; Allawi & Abdulfattah, 1984).

The inefficiency of thermoregulatory mechanisms in conditions that include a change in ambient temperature and the level of physical activity leads to a change in the temperature of the body center (Al-Nuaimi, 1996). It increases with the increase in the heat generated in the body. It may be (20) higher than the skin temperature. But, the ideal difference between these two degrees is (4) Celsius degrees during rest. The exposure of the body to a cold environment leads to a decrease in the temperature of the body center (ibid).

The natural functions of the body are relatively dependent on the stability of body temperature. The speed of chemical reactions and the activity of enzymes is affected by heat (Ganong, 1981; Al-Nuaimi, 1996). So, the variation in temperature affects almost the physical, chemical, and life processes. If the human body is cooled to a certain temperature, enzymes, especially brain cells, lose their activity, the cell level metabolism is disrupted, and breathing decreases and may stop. If the cells are cooled to the freezing point, this leads to tissue damage. On the other hand, increasing the temperature leads to increasing the activity of enzymes to be greater than what is needed by cellular functions, especially in the brain, which leads to a defect in cellular activity. When the temperature rises above (42.8) Celsius degrees, this leads to damaging the enzymes. When the temperature exceeds (45), an abnormal change begins in vital proteins (Al-Nuaimi, 1996; Ganong, 1998; Allawi & Abdulfattah, 1984).

The regulation of heat lost by the skin, which contributes to maintaining the appropriate body temperature, is one of the basic functions of the vasomotor system (Addai, 1987). That is controlled by the sympathetic nervous system, which controls the process of vasoconstriction in response to the changes taking place as a reaction to changes in the temperature of the center of the body and the temperature of the outer periphery. Therefore, blood flow is one of the very effective mechanisms for transferring heat from the center of the body to the skin, which in turn is also an effective device for radiating heat (Guyton & Hall, 2006).

If the environment temperature becomes lower than the ideal temperature, the difference between the skin and environment temperature increases, which results in an increase in heat loss through the processes of conduction and radiation (Astrand, 1977). This leads to a decrease in the temperature of the skin. As a result, the blood vessels will shrink, the blood flow in the skin area will decrease, and the blood will be directed to the deep veins that run alongside the arteries. As a result of this convergence, the heat will be transferred from the arterial blood to the venous blood and returned to the body before it reaches the skin. The process of heat exchange between warm arterial blood and colder venous blood is called the countercurrent exchange (Ganong, 1981).

It is worth noting that the reduction in the amount of blood flowing as a result of the narrowing of the skin blood vessels occurs all over the body except for the head area. This is why large amounts of heat are lost on a cold day through radiation if the head is not covered (Fox EL, 1981). The efficiency of heat transfer by blood vessels is directly proportional to the high blood flow velocity. The efficiency of heat conduction increases from the center of the body to the skin. On the contrary, the efficiency of heat conduction decreases from the center of the body to the skin with a decrease in blood flow (Guyton & Hall, 2006).

Breaths number (RR)

It is the respiratory rate per minute, which is (12) times per minute in healthy adults in the state of rest (Sayed, 2003). The number of breathing times varies according to the person's age, the effort he/she exerts, the temperature in which he/she lives, the general state of health, as well as the degree of filling the digestive system with food (Salama, 1988). The number of breathing times "is one of the two main variables in increasing or decreasing pulmonary ventilation in addition to the normal breath volume. Increasing these two factors together or increasing one of them leads to an increase in pulmonary ventilation. The number of breaths per minute during rest is (12 -20) times per minute, which rises to (50-60) times per minute during training (Al-Hajjar, 1994).

During intense exercise, the number of breathing times usually increases to (35-45) times per minute in young adults of good health, although (60-70) times per minute rates have been recorded during maximum exercise for males and females participating in the Olympic speed skating (McCardle et al. 2006).

Blood Pressure

Pressure is the "moving force of blood within the circulatory system, which means that blood travels from an area of high pressure to another area with less pressure. Blood flows from the left atrium causing pressure inside it to rise to a less pressure area, which is the area of large arteries. After that, blood flows to small arteries, capillaries, small veins, veins, until it flows again into the right atrium of the heart due to the difference in pressure between one area and another (Allawi and Abdulfattah, 2000).

Systolic and diastolic blood pressure

Blood pressure is the force that blood exerts on the walls of the vessel it passes through. Blood pressure depends on the volume of blood inside the vein and the resistance of the vein walls. If the volume of blood entering the arteries is equal to its volume while leaving the arteries during the same period, then the arterial blood pressure will remain constant. But, this is not exactly the case all the time. During systole, a certain volume of the heartbeat will enter the arteries from the atrium. At the same time, only two-thirds of this blood will leave the large arteries to the small arteries. During diastole, no amount of blood enters the arteries, while blood continues to leave using a rubber recoil. The maximum pressure exerted on the arteries when the blood begins to flow into the arteries during systole is called the systolic pressure, which is at a rate of (120) mm Hg. Diastolic Pressure is at a rate of (80) mm Hg. The arterial blood pressure cannot drop to zero because there will be a subsequent cardiac contraction process and the arteries will fill again before all the blood is drained from them. During exercises, blood pressure variables respond to varying degrees. Aerobic effort elicits blood pressure responses that differ from anaerobic exercise (MacDonald JR, 2002; Sherwood L, 2004).

Factors affecting blood pressure

Several factors directly affect blood pressure, which can be summarized as follows:

1. Age
Blood pressure is low in children, reaching (70/50) mm Hg, but it noticeably increases at puberty. Then, it increases more in old age until it reaches (150/90) mm Hg.
2. Gender
The pressure is approximately the same for both genders in childhood. At the age of (10-16) years, blood pressure in females is higher than in males. At puberty, the pressure in females is lower than in males. As for over the age of (40) years, the pressure on females is high.
3. Digestion of food
After eating meals, a slight increase in blood pressure occurs, which may reach (5-10) mm Hg.
4. Emotional states
Emotional states cause a noticeable increase in blood pressure.
5. Physical exertion
It leads to a temporary increase in systolic pressure, which then quickly returns to its normal level after a while.
6. Body position
Blood pressure differs when standing than when sitting or any other position taken by the body.

Temperature

A decrease in temperature leads to an increase in blood pressure as a result of an increase in cardiac output and an increase in peripheral standing as a result of

vascular contraction. An increase in body temperature leads to a decrease in blood pressure by a mechanism that is opposite to what happens when body temperature decreases (Sayed, 2003).

Blood pressure during physical exertion

Heart capacity increases with physical exertion. Thus, blood pressure increases, but this increase remains within certain limits during any physical exertion. Blood vessels in the internal organs shrink to push blood to other parts of the body and maintain blood pressure at its normal range. When a person performs a muscular effort during this period, the opposite may happen. The vessels expand, which may lead to a drop in pressure, which may result in a decrease in the amount of blood going to the organs. The vessels also expand in muscles in which resistance decreases, which leads to a decrease in blood pressure due to large amounts of blood. The sudden drop in blood pressure causes the nerves in the walls of the aorta to be stimulated, which results in increased heart activity and constriction of blood vessels in the extremities, which results in high blood pressure (Al-Bishtawi & Ismail, 2006).

Heart rate (HR)

The number of heartbeats is one of the functional variables that are easy to observe and measure as an indicator of the functional changes that occur to the athlete during and after the physical effort. Through it, the sports coach can evaluate the player or athlete's training and physical condition. Moreover, through this variable, training programs are built in terms of the intensity of exercise and rationing the rest periods between repetitions and totals to suit the type of that program and according to the sporting activity. Heart Rate (HR) is defined as the number of times the heart beats per minute (Al-Kit, 2006). It is also defined as the number of ventricular beats per minute (Åstrand and Rodahl, 1977). The renewal of the heart rate is done by the rhythm of excitation in the sinoatrial node. Influencing factors cause changes in the heart rate in the SA node, which controls the heart rate (Abu Al-Ula and Hassanain, 1997). The heart rate of non-trained people is between (60-89) beats/minute at rest time. The recorded increase is known as (tachycardia), which means the increase in the number of heartbeats, which appears as a result of the disruption of the heart's work system during rest time, the psychological state as well as in the case of heart disease. The phenomenon of slow heart rate means that heart rate is less than 60 beats/minute at rest time for many athletes, especially when the measurement is taken immediately after waking up and the body is still in a lying position. The phenomenon of the slow heartbeat has been observed in many athletes at all times of wakefulness, except during times of competition or training. Some studies have proven that this phenomenon does not occur for athletes at midday when a measurement is taken in the vertical position. The slow down of heart rate for some athletes is limited to the use of the heart muscle, which is of high health importance. For an athlete, the total heart rate during days without matches or training decreases by about (15-25%) when it is compared to non-athletes of the same age and gender. The phenomenon of slow heart rate is linked to the heart and the nature of the exercised sports activity. For example, this phenomenon is noticed in endurance sports, such as ski players and long-distance running,

whose heart rate ranges between (40-50) beats / minute. As for athletes in sports that require strength that is characterized by speed, skillful performance, or a high degree of neuromuscular coordination, the phenomenon of bradycardia does not appear clearly and the following levels can be used to judge the heart rate:

- Less than (60) beats / minute is considered a slow rate.
- From (60-100) beats / minute is considered a normal rate.
- More than (100) beats / minute is considered a rapid rate (Abu Al-Ula and Hassanain, 1997).

There is a maximum number of heartbeats. That maximum number expresses heartbeats per minute during physical exertion. This rate is usually between (180-220 beats per minute) (Al-Kitt, 2006). As for the correlation of heart rate with the type of sports activity, the largest value of the acceleration in the number of heartbeats occurs in the speed activities until it reaches its maximum. The least acceleration occurs in the power activities such as Throwing weights and lifting weights for men. The average case of acceleration is in endurance activities (Al-Tikriti & Al-Hajjar, 2012).

The heart rate is directly proportional to the intensity of the exerted effort. It increases during physical activities and continues to rise with the increase in the intensity of physical work until it reaches its maximum. In this case, the heart rate may reach (200) beats per minute (Sayed, 2003). The maximum value of the heart rate for some distinguished athletes when performing intense and high physical exertion may reach (220) beats per minute (Karporich & Sining, 1971).

Effect of temperature on heart rate

The high temperature leads to an enormous increase in the heart rate. It sometimes reaches to a large extent twice its normal limit. The decrease in temperature leads to a decrease in the heart rate, which may drop to a few beats per minute when the person approaches death due to hypothermia temperature, which is (15.5 - 21.1C). These effects are generated because heat increases the permeability of the muscle membranes to ions, which leads to an acceleration of the self-excitation process (Guyton and Hall, 2006).

Effect of stress on heart rate

The sympathetic and parasympathetic systems have a significant role in influencing the heart rate at rest and during exercise. The sympathetic system increases the rate of Heartbeat. This increase in heart rate is caused by the decrease in the activity of the parasympathetic nervous system with the progression of exercise so that the sympathetic nervous system becomes dominant in the increase in heart rate and the regression of the parasympathetic nervous tone (Al-Qattan, 2013; Hautala, 2004; William et al. 1995). This is a scientific fact that is confirmed by many scientific sources. It was mentioned that strenuous exercise often leads to a decrease in the heart rate during rest and an increase in the stroke volume during rest due to the degree of obstruction of the SA node by the vagus nerve. The reduction in heart rate in the recovery phase is

thought to be due to an increase in heart rate at rest and an increase in the amount of blood pumped by the heart (Fox, 2006).

The heart rate gives implicit and clear signals for the type of exercise. It is directly related to the intensity of the load achieved. Heart rate can be used to determine the energy system used by the athlete during exercise as well as to determine the levels of exercise intensity and effort expended in it. Therefore, heart rate is one of the important means available to both the trainer and the athlete. More specifically, heart rate is an indicator of exercise intensity. It also provides recovery periods between repetitions and helps prevent overtraining and stress by signaling that the athlete cannot adequately recover (Gorgees, 2005).

The procedures

The Research Methodology

The researcher used the descriptive comparative causal method as it fits the nature of the present study.

The research community and its sample

After the researcher deliberately limited the research community to (18) players from the Nineveh Province swimming team, whose ages are young, (12) players were intentionally chosen from this community. The percentage of the research sample selected from the total research community is (66.66%).

Homogeneity of the research sample

Homogenization was carried out in the four variables of height, age, weight, and training as shown in Table (1).

Table (1) Values of the arithmetic means, standard deviations, and the variation coefficient for the variables in which homogeneity was made

Variables	Arithmetic mean	Standard deviation	Variation coefficient
Age (year)	16.18	0.70	4.32
Height (cm)	167	6.67	3.99
Weight (kg)	55.78	5.40	9.68
Training age (year)	7.20	0	58
8.05			

In Table (1), the values of variation coefficient for the variables of age, height, weight, and training are (4.32, 3.99, 9.68, and 8.05) respectively, which indicates that the sample is homogeneous as if the value of variation coefficient is less than (30), the sample is considered homogeneous (Allawi and Radhwan, 2008).

Medical examination

A medical examination was conducted by a specialized doctor to ensure the safety of the research sample from diseases that could affect the research variables.

Means of data collection

Tests, measurements, technical devices, and scientific sources were used as means of collecting data.

Devices and tools used in the present study

1. A sensitive scale for measuring weight to the nearest (1) gram, made in Japan, from the (Silver Crest) type.
2. One tape measure.
3. Four stopwatches to measure the pulse.
4. One electronic device for measuring humidity inside the swimming pool.
5. One Mercury blood pressure measuring device (Sphygmomanometer).
6. Two Japanese Stethoscopes.
7. Twelve electronic digital thermometers to measure the temperature of the center and surface of the body.
8. A sterile material without odor to sterilize the thermometers.
9. Two digital stopwatches that measure to the nearest (1/100) of the second.

Measurements and tests**Body measurements****Height measurement**

The researcher used a wall that she graded. The person stands barefoot with his/her back attached to the wall, the back of the feet are also attached to the wall, hips and shoulder blades are attached in the same way, and looking forward. The length was measured from the ground to the highest point of the head by placing a ruler horizontally above the head that intersects with the graded wall in an upright manner pointing To the player's height in centimeters. The measurement was taken to the nearest half-centimeter.

Measurement of weight

The weight was measured with a sensitive scale. The person was asked to stand on the scale wearing only short pants. It was measured to the nearest (50 g).

Measurement of functional variables**Measurement of skin temperature**

Skin temperature was measured by placing special electronic thermometers on the four skin areas of the arm, torso, leg, and head. These four areas are included

in a statistical equation through which the skin temperature can be obtained as follows:

$$T_{\text{skin}} = (0.1 \times T_a) + (0.6 \times T_t) + (0.2 \times T_l) + (0.1 \times T_h) \text{ (Elmore Costell, 1994).}$$

T_a represents arm temperature

T_t represents the stem temperature

T_l represents man's temperature

T_h represents the head temperature

Measuring the temperature of the center of the body

Center temperature was measured by a medical thermometer, which is placed under the tongue. When a beep is heard from the thermometer, after one minute, the thermometer is pulled out and the degree is read, taking into account the addition of (0.6) as a correction factor (Guyton, 2006).

Respiration rate (RR)

The number of breaths was measured using a look and feel method. The hand was placed on the chest area, looking at the movement of the rib cage, using a stopwatch to calculate the number of breaths during one minute.

Measurement of blood pressure

The measurement is made using a stethoscope and mercury manometer. The ligament is wrapped on the humerus of the laboratory and then the amplified stethoscope is inserted into the ligament towards the mercury manometer. The measurer begins with manual inflation, which will increase the air pressure inside the tape ligament than the pressure inside the artery and thus cut off the blood flow in the artery. Then, it begins to gradually reduce the pressure of the ligament, and the pressure of the ligament decreases in the direction of the pressure inside the artery. After both pressures are equal, the sound of the first wave or blood spurt is heard. The first sound has systolic blood pressure and the diastolic blood pressure is recorded by the disappearance of the sound (Sherwood L, 2004).

Heart rate (HR) measurement

The medical stethoscope was used by placed on the heart area. A stopwatch was also used for (15) seconds. After that, the number was multiplied by (4) to obtain the heart rate per minute.

The first experiment

The first exploratory experiment was conducted on (5/12/2018) at (2.00) in the afternoon and lasted three hours on the research sample. The experiment aimed to familiarize the research sample with the experimental procedures. All research variables were measured. That was done to identify the obstacles that the researcher may face when carrying out the main experiment. The water temperature was (18C) and the environment temperature was (19 C).

The second experiment

The second exploratory experiment was conducted on (7/12/2018) at exactly one o'clock in the afternoon. The same steps were taken for the first experiment. The water temperature was (28 C) and the environment temperature was (30 C).

The First Main Experiment

The first main experiment was conducted on Thursday (December 14, 2018) in the outdoor swimming pool of water towers city. The water temperature was (18) degrees Celsius. The experiment lasted for an hour. It started at (3:00 pm) and ended at exactly (4:00 pm) as follows:

1. The player was immersed in water for (5) minutes.
2. The player warmed up for (15) minutes outside and inside the swimming pool.
3. The player swam for a distance of (50 m) in freestyle swimming.
4. The performance time was calculated using a digital stopwatch.
5. Upon completion of swimming, all variables were measured.

The second main experiment

The second main experiment was conducted on Saturday (16/12/2018). The procedures of the first main experiment were repeated with a water temperature of (28) Celsius degrees.

Statistical means

The researcher used the following statistical methods:

1. Arithmetic mean.
2. Standard deviation.
3. T-Test for related samples.
4. Variation coefficient.
5. SPSS version (11.0) was used for statistical processing of data.

Presentation and discussion of the results

Presentation of the results related to the level of achievement and the temperatures of the center and the skin

Table (2) The arithmetic means, standard deviations, and the calculated T-value for the level of achievement and the temperature of the center and skin between the two thermal conditions

Functional variables	Arithmetic mean	Standard deviation	T-value	Probability value	Error rate	Significance
Level of achievement	36.43	0.923	14.64	0.00	0.05	Significant

in the low condition						
Level of achievement at the moderate level	34.16	0.324				
Center temperature at the low condition	35.45	0.479	16.44	0.00	0.05	Significant
Center temperature at the moderate condition	37.78	0.482				
Skin temperature at the low condition	32.96	0.644	17.62	0.00	0.05	Significant
Skin temperature in the moderate condition	35.69	0.416				

It is clear from the table (2) that there are significant differences in the level of achievement and the temperatures of the center and the skin between the two thermal conditions in favor of the moderate thermal condition about the level of achievement in favor of the low thermal condition about the two temperatures. The calculated T-value for the three variables was (14.64, 16.44, and 17.62) with a probability of (0.00) at an error rate of (0.05).

Discussing the results related to the level of achievement and the temperatures of the center and the skin

With regard to the level of achievement, it is mentioned that cold weather makes muscles weak inefficient and that the nervous system responds to cold muscles by changing the patterns of mobilization of natural muscle tissue. Some researchers mentioned that this change in tissue selection to produce force reduces the efficiency of muscle work And the speed and strength of the muscle decrease as the temperature decreases (Ganong, 1981). When individuals are sufficiently isolated from the influence of cold water, muscle strength, muscle elongation, and achievement in exercise are not negatively affected. But, when the isolation is not sufficient, muscle strength, muscle elongation, achievement, and muscular coordination weaken (Foss and Keteyin, 1998).

From the foregoing, the researcher attributes the better achievement in the moderate water environment than in the cold environment, in addition to the previous reasons, to the increase in the maximum value of oxygen consumption

in the moderate water environment. The present study agreed with what was stated by (Michael M, et al. 2012) in their research on a sample of swimmers at water temperatures of (20) and (26) Celsius degrees. They swam for a distance of (1 km). The maximum value of oxygen consumption was (VO₂ max) in water with a temperature of (26) higher than the maximum value of oxygen consumption (VO₂ max), as well as the achievement was better in moderate water (26) C ° (Michael M, et al. 2012).

The present study also agreed with what was stated by (Al-Tai, 2017) who mentioned that the level of achievement in swimming in moderate temperatures was better than it is in low temperatures (Al-Taei,2017). As for the temperature of the center and the skin, it is mentioned that to defend the temperature of the center, the surrounding blood vessels constrict and vasoconstriction occurs when the skin temperature drops below (95°F) 35 C°). It is at its peak when the skin temperature is below (88F) 31C°). The center temperature defense is also achieved by increased metabolic heat production, primarily by the muscle shivering response (Hoffman, 2002).

The surface of the body loses heat to the external environment through radiation, conduction, convection, and water evaporation. Heat can be gained under certain conditions instead of losing it (Vander et al. 1998). Exposure to cold air or cold water leads to the transfer of body heat to the surrounding environment, which takes place from the center of the body to the skin and the skin to the outer environment. Most of the heat loss from the skin occurs through the conduction mechanism or convection when the temperature is Ambient temperature that is less than body center temperature (Hoffman, 2002).

From the above, the researcher attributes the lower skin and center temperatures in the cold water environment than in the temperate water environment to the loss of heat in cold water through the two processes of conduction and convection as a result of contact with a cold water environment. The transfer of body heat by the conduction mechanism is (25) times more in water than it is in the air (ibid). The present study also agrees with what was stated by (Dimitris et al., 2008) in their research, which was conducted on their sample of swimmers. They swam for a distance of (1) kilometer at high and low temperatures. The researchers noticed a decrease in the temperature of the center to (35C) after swimming in the cold water (Dimitris et al. 2008).

Presentation of the results for the number of breathing times, systolic and diastolic blood pressure, and the number of heartbeats

Table (3) The arithmetic means, standard deviations, and the calculated T-value for the number of breaths, systolic and diastolic blood pressure, and the number of heartbeats between the two thermal conditions

Functional variables	Arithmetic mean	Standard deviation	T-value	Probability value	Error rate	Significance
Breaths frequency in the low	42.42	0.881	9.38	0.00	0.05	Significant

condition						
Breaths frequency in the moderate condition	36.42	0.793				
Systolic pressure at the low condition	161.67	3.892	8.80	0.00	0.05	Significant
systolic pressure at the moderate condition	147.50	5.000				
Diastolic pressure in the low condition	85.42	3.965	12.52	0.00	0.05	Significant
Diastolic pressure in the moderate condition	73.33	2.462				
Heart rate in the low condition	159.27	4.585	14.19	0.00	0.05	Significant
Heart rate in the moderate condition	178.73	4.692				

It is clear from Table (3) that there are significant differences in the number of heartbeats, systolic and diastolic blood pressure, and the number of heartbeats that are in favor of the low-temperature condition, except for the number of heartbeats, where the difference was in favor of the moderate heat condition.

Discussing the results related to the number of breathing times, systolic and diastolic blood pressure, and the number of heartbeats

Regarding the number of breathing times, it is mentioned that when the temperature drops, breathing becomes deep and rapid (Wilmore and Costll, 1994). The first stage of immersion under water is called cold shock. Its duration is from (3) -to 5) Minutes accompanied by an excessive increase in pulmonary ventilation at the expense of the number of breaths. The number of breaths may double (4-5) times the normal value, especially in the first (30-60) seconds of going down to cold water. The researcher believes that this increase is neural reflexes by increasing the work of the sympathetic nervous system as a result of the action of cold receptors in the body, especially those in the skin and spinal cord, and its effect on the motor nerves, which leads to an increase in the

shivering process and an increase in the level of metabolic processes to produce metabolic and thermal energy, which increases the amount of bilateral Carbon dioxide, which leads to an increase in the number of breathing times to get rid of it.

As for systolic and diastolic blood pressure, the researcher attributes the increase in blood pressure in the cold water environment than in the moderate water environment immediately after exertion to the increase in vascular resistance in the cold environment. It is mentioned that the most important factor in vascular resistance is the friction between the blood and the vascular wall. The amount of friction depends on the vessel's length and diameter (Tawfeeq, 2005). Since the length of the vessel is fixed except if it is infected with some sedimentation and metabolic wastes, the difference in the diameter of the vessel has a direct effect on vascular resistance. Most peripheral resistance occurs in the arterioles, which are the smallest vessels in the arterial system. There are muscles in the arterioles. When smooth muscles contract or relax, the resistance increases or decreases (ibid). An increase in the ambient temperature by one Celsius degree leads to a decrease in blood pressure by (0.31 mmHg) (Barnett et al. 2007). Changes in blood pressure of young people, when they are immersed in cold and moderate water, were obtained in the systolic and diastolic blood pressures between the two mediums. There was a rise in both pressures in cold water and in moderate ones (Hildenbrand et al. 2010).

About the number of heartbeats, it is mentioned that the low heart rate (HR) in cold water leads to an increase in the venous return of blood, which may cause an increase in cardiac output and high pressure through the reflexes of baroreceptors that are located in the carotid sinus and aortic arch and cause a decrease in the number of heartbeats (Al-Hassu, 2001). It is also mentioned that the heart rate, whether at rest or during exercise, is affected by changes in the ambient temperature and relative humidity (Al-Kitt, 2006).

From the above, the researcher attributes the decrease in the heart rate in the cold water environment when it is compared to the temperate water environment to the fact that the cold water led to an increase in the size of the heartbeat. It is mentioned that working in a cold environment leads to vasoconstriction through blood transfusion from the vessels under the skin to the center of the body. It is also mentioned that exposure to a cold atmosphere transfers blood from the subcutaneous tissues to the center of the body, which leads to an increase in venous return and thus an increase in the volume of the heartbeat (Foss and Keteyin, 1998). It is also stated that increasing the amount of blood pushed in one heartbeat leads to a decrease in the pulse rate (James, 1988).

The researcher believes that the relationship in these circumstances between the heartbeat volume and the number of heartbeats is an inverse relationship. Increasing the heartbeat volume leads to a decrease in the heart rate during exertion although the exerted effort leads to an increase in the number of heartbeats to meet the body's energy needs, in return, the body lost an amount of its produced heat when swimming in cold water as a result of the increase in the conduction and load processes of the water current, which led to a decrease in the number of heartbeats by about (20) beats per minute as a result of the

increase in the size of the heartbeat. The present study agrees with the results of the study of (Deligiannis, et al. 1993). They experimented on a group of swimmers who swam for (30) minutes at different temperatures (20, 26, and 32) Celsius degrees.

Conclusions and Recommendations

Conclusions

1. There are significant differences in the level of achievement in the (50 meters) freestyle swimming in the two thermal conditions in favor of the moderate thermal condition.
2. There are significant differences in the temperature of the center of the body between the two thermal conditions in favor of the moderate thermal condition.
3. There are significant differences in skin temperature between the two thermal conditions in favor of the moderate thermal condition.
4. There are significant differences in systolic blood pressure between the two temperature conditions in favor of the low-temperature condition.
5. There are significant differences in diastolic blood pressure between the two temperature conditions in favor of the low-temperature condition.
6. There are significant differences in the number of heartbeats between the two thermal conditions in favor of the moderate thermal condition.

Recommendations

1. Conducting similar studies that deal with other influential variables.
2. Taking into account that training in low temperatures causes blood pressure to rise even more.
3. Taking into account that training in low temperatures leads to a lower heart rate.

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