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The effect of using a training mask on improving cardiovascular adaptation in athletes A field study on some kung fu and wushu athletes, Najm Saleh Bey Setif

أثر استخدام قناع التدريب في تحسين التكيف القلبي الوعائي لدى الرياضيين دراسة ميدانية على بعض رياضيي كونغ فو ووشو نجم صالح باي سطيف

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Abstract: This study aimed to clarify the importance of using the training mask in developing the efficiency of the cardiovascular system, as it was used as a training tool to improve the efficiency of the heart muscle and strengthen blood circulation during or after physical effort. The experimental method was used on an intended sample consisting of (10) ten Kung Fu Wushu athletes (class of senior males), divided into two groups (control, experimental), and the Ruffier-Dickson test was performed on them using a Smart Pro M4 cardiac watch, where the interval was Between the pre and post measurement (30) thirty days. Through the results of this study, we concluded that the training mask helps in improving the Ruffier-Dickson index as well as improving the resting pulse, which helps in developing the efficiency of the cardiovascular system, and from this we recommend using the training mask in order to develop the capabilities of the cardiovascular system with a strong effect.

Keywords: Training mask ; Cardiovascular adaptation ; Resting pulse ; Ruffier-Dickson test.

الملخص:

هدفت هذه الدراسة إلى توضيح أهمية استخدام قناع التدريب في تنمية كفاءة الجهاز القلبي الوعائي، حيث استعمل كأداة تدريبية لتحسين كفاءة عضلة القلب وتقوية الدورة الدموية أثناء القيام بجهد بدني أو بعده. استخدم المنهج التجريبي على عينة مقصودة تتكون من (10) عشر رياضي كونغ فو ووشو (صنف أكابر ذكور)، قسموا إلى مجموعتين (ضابطة، تجريبية)، أجري عليهم اختبار Ruffier-Dickson بواسطة ساعة قلبية من نوع Smart Pro M4، حيث كانت المدة الفاصلة بين القياس القبلي والبعدي (30) ثلاثون يوما. من خلال نتائج هذه الدراسة استنتجنا أن قناع التدريب يساعد في تحسين مؤشر Ruffier-Dickson وكذلك تحسين النبض في حالة الراحة، مما يساعد في تنمية كفاءة الجهاز

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القلبي الوعائي، ومن هذا فإننا ننصح باستخدام قناع التدريب لأجل تنمية قدرات الجهاز القلبي الوعائي وبتأثير قوي،

- **الكلمات المفتاحية:** قناع التدريب، التكيف القلبي الوعائي، نبض الراحة، اختبار Ruffier-Dickson

Introduction and problematic of the study: Sports training is an organized educational process that is subject to scientific foundations and principles, mainly aiming to prepare the individual to achieve the highest possible athletic level in sports competitions or in a specific type of sport (Allaoui, 2001,17). An interest in hypoxia training has emerged in recent years, as it has found great demand by training personnel (Allaoui & Abulaala, 2009), as studies have shown physiological changes in athletes who use a training mask. One of the most important adaptations that occur in the body systems is the adaptation of the cardiovascular system, as the practice of training for long periods affects the efficiency of the heart muscle, depending on the type of sports activity practiced by the player, and these changes are called central changes or central adaptations, that is a group of physiological factors or variables that affect the susceptibility and ability of the heart muscle to obtain blood (oxygen and fuel) for working muscles (Al-Jaber, 1998, 251). The physical exercise program has exciting results on the heart and the circulatory system and on the development of recovery ability (Bafa & Zemmam, 2022). to and from the heart), as the need for beats is less to push the amount of blood required, and the heart rate and blood pressure decrease after physical effort more quickly to return to the normal rate (Al-Azzaoui, 2016, 243). Scientific studies have shown that the basis of modern training includes integrated training oriented towards work by mixing all the physical, technical, tactical and psychological characteristics for the occurrence of the adaptation process (Dellal, 2008, 214). Above sea level on their physical performance (Grégoire & laurent, 2011, 35). Therefore, the use of modern training methods is important and necessary, whether in the sports evaluation process (Khoudja, 2022) or in the training process (Mekhazni & Ghadbane, 2021; Bentoumia, Bengoua & Baroudi, 2019) to bring about these positive physiological changes in athletes, and the training

mask is one of these means (Kharbit & Aboulaala, 2016, 673), and on this basis we can ask the following main question:

- How effective is the training mask in improving cardiovascular adaptation?

In order to facilitate the process of scientific research, we have divided the general question into two partial questions:

- Does a training mask help improve the resting pulse of athletes?
- Does the training mask help improve the physical recovery rate of athletes?

Followed Methodologies: We conducted an exploratory study in order to know the limits of applying the test from all aspects (spatial, temporal, human and technical) in order to avoid the initial problems in the basic study. Where the athletes lay on the ground for (5) five minutes, then their heartbeats were measured (at rest) by a smart pro M4 cardiac watch, immediately after that the Ruffier-Dickson test was performed, then the results were recorded and after a full hour of passive rest the test was re-applied to check the validity and reliability of the test.

Table (01) shows the validity and reliability of the tests and measurements used using the Pearson test

	FC_{rep} (P/min)	Rf Dickson
Reability	0.986	0.812
Validity	0.992	0.901

Through the previous table, we notice that all reability values are completely greater than (0.80), and this is evidence of a very strong reability of the test, and validity is the square root of reability, so all its values shown in the table are close to or equal to (01), which confirms the validity of this test.

We used the experimental approach due to its suitability for the study, where the study sample consisted of (10) ten senior athletes (less than 21 years old) males of Saleh Bay Star Club for

combat sports specializing in Kung Fu Wushu with good health and permanent practitioners of training, who were chosen in a deliberate manner and divided into two groups (control, experimental), and then the homogeneity of the sample was confirmed by Levene test for homogeneity.

Table (02) shows the results of the Levene test for homogeneity of variance based on the arithmetic mean

	Fisher's factor	Levene	Df_1	Df_2	Level of signification	Observation
Age	0.05	0	1	8	1	Homogeneous
Wight		0.48			0.508	Homogeneous
Leigh		0.571			0.471	Homogeneous
Sleeping		0.122			0.736	Homogeneous
Training		0.371			0.559	Homogeneous
Resting pulse		0.135			0.723	Homogeneous
Ruffier-Dickson test		0.511			0.495	Homogeneous

Through the Levene test, it is clear to us that all statistical significance values are completely greater than (0.05), and this indicates that there are no significant differences in the research sample, which we infer from the homogeneity of the research sample.

A work team consisting of (3) three individuals was used, where the team measured the number of heart beats by means of the cardiac clock, and in the application of the Ruffier-Dickson test, the same tool was used to measure the pulse immediately after the effort and after (1) one minute of physical effort.

Table (03) shows the results of the chapiro-wilk test for the normal distribution of the sample

	Properties	Calculate	Sig	Observation
Athropometriques measurements	Weight	0.937	0.516	Normal distribution
	Height	0.972	0.907	Normal distribution
	Sleeping	0.926	0.410	Normal distribution
	Training	0.935	0.499	Normal distribution
Fontional tests	Resting pulse	0.953	0.702	Normal distribution
	Ruffier-Dickson	0.981	0.971	Normal distribution

Through the previous table, it is clear that all probability values are completely greater than (0.05), and this indicates that all values are distributed normally, and the Levene test indicates that the sample is homogeneous, so (t) tests can be applied to the sample.

Exposure, analyses and result exam:

Table (04) shows the results of the Shapiro-Wilk test to see how far the values follow the normal distribution between the pre and post measurement of the control group with regard to the resting pulse

Properties	Pre test		Post test		Observation
	Calculate	Sig	Calculate	Sig	
FC_{rep}	0.971	0.879	0.955	0.774	Normal distribution

It is clear to us through the previous table that the significance values for both pre and post measurements are completely greater than (0.07), and this indicates a moderate distribution of all values of the control sample, which makes us decide to use the Student (T) test to study the differences between the pre and post measurements.

Table (05) shows the difference between the pre-measurement of the control and experimental groups with respect to resting pulse indices

	Sig f	Meaning	T calculate	T tabulate	Observation
FC_{rep}	0.72	0.63	0.491	1.86	No significant

Through the previous table, it is clear to us that the significance value of f is completely greater than (0.05), and the calculated (t) value is smaller than the tabular (t) value, and this indicates that there are no statistically significant differences between the pre and post measurements.

Table (06) shows the results of the Shapiro-Wilk test to find out the extent to which the values follow the normal distribution between the pre and post measurement of the experimental sample with regard to the resting pulse

Properties	Pre test		Post test		Observation
	Calculate	Sig	Calculate	Sig	
FC_{rep}	0.915	0.498	0.849	0.192	Normal distribution

Through the previous table, it is clear to us that the calculated values of the resting pulse follow the normal distribution, as the sig values are completely greater than (0.05) in the pre and post measurement, which makes us decide to accept the use of the student (T) test to study the differences between the values and averages for the pre and post measurement.

Table (07) shows the difference between the pre and post measurement of the control group in relation to the resting pulse index

	Sig	T calculate	T tabulate	Observation
Fc_{rep}	0.621	0.535	2.13	No significant

Through the previous table, it is clear to us that the calculated value of (t) is completely smaller than the value of (t) tabular, and that the significance value is completely greater than (0.05), this indicates that there are no differences between the arithmetic means of the pre and post measurement of the control group regarding the resting pulse index of the heart.

Table (08) shows the difference between the pre and post measurement of the experimental sample in relation to the resting pulse index

	Sig	T calculate	T tabulate	Observation
Fc_{rep}	0.008	4.824	2.13	Significant

Through the previous table, we can see that the Sig value is completely smaller than (0.05), and the calculated (t) value is completely greater than the tabular (t) value, and this indicates that there are statistically significant differences regarding the resting pulse variable of the heart in favor of the telemetry.

Table (09) shows the difference between the pre-measurements of the control and experimental groups for physical retrieval

	Sig	T calculate	T tabulate	Observation
Ruffier Dickson test	0.49	0.17	1.86	No significant

Through the results of the previous table, we find that the probability value is completely greater than (0.05), and the calculated (t) value is completely smaller than the tabular (t), which confirms that there are no statistically significant differences between these two groups.

Table (10) shows the results of the Shapiro-Wilk test to see how far the values follow the normal distribution between the pre and post measurements of the control group with regard to physical recall

Properties	Pre test		Post test		Observation
	Calculate	Sig	Calculate	Sig	
Ruffier Dickson test	0.995	0.994	0.938	0.651	Normal distribution

We can see from the previous table that the calculated values are distributed moderately, that the Sig values are completely greater than (0.05), and this indicates that the Student (T) test can be used to study the differences.

Table (11) shows the difference between the pre and post measurement of the control group regarding physical retrieval

	Sig	T calculate	T tabulate	Observation
Ruffier Dickson test	0.548	0.655	2.13	No significant

From the results of the previous table, we find that the calculated (t) value is completely less than the tabular (t) value, and that the significance values are completely greater than (0.05), and this means that there are no statistically significant differences in the post-measurement of the control group with regard to physical recall.

Table (12) shows the results of the Shapiro-Wilk test to see how far the values follow the normal distribution between the pre and post measurements of the experimental group with regard to physical recall

Properties	Pre test		Post test		Observation
	Calcutale	Sig	Calculate	Sig	
Ruffier Dickson test	0.993	0.989	0.806	0.09	Normal distribution

From the previous table, we can see that the significance values are completely greater than (0.05), meaning that the normal distribution is normal, and that we can use the Student (T) test to calculate the differences.

Table (13) shows the difference between the pre and post measurement of the experimental group regarding physical retrieval

	Sig	T calculate	T tabulate	Observation
Ruffier Dickson test	0.03	6.635	2.13	Significant

Through the results of the previous table, it is clear to us that the value of statistical significance is completely smaller than (0.05), and that the calculated (t) value is completely greater than the tabular (t) value, and this indicates that there are statistically significant differences for the experimental group.

Table (14) shows the results of Cohen's D test for the effect size of the pre and post measurement of the experimental group

	n	T	D	Impact
FCrep	5	4.824	2.16	Strong
Ruffier Dickson test		6.635	2.96	

Through the previous table, we conclude that the Cohen's D value is completely greater than (0.8), and this indicates that there is a significant effect of the training mask on improving the resting heart rate (by decreasing it), as well as improving the Ruffier Dickson coefficient.

Finding and propositions results

By interpreting the results of the tables related to the first partial question, we found that the training mask improves the resting pulse of the athletes, and thus the heart rate decreases. Long endurance training reduces the maximum heart rate as well as the resting rate, achieving a pulse rate of 40-45 beats/minute (Rochdi, 1997, 63). as Vogt & Hoppler sees (2010, 52) hypoxia training is followed by a series of physiological changes, which are represented by training the breathing muscles, increasing the volume of blood cells and plasma after a temporary decrease, increasing the ability of oxidative enzymes in the muscle, converting muscle consumption from fat and glycogen to blood glucose, decreasing the production of ammonia and lactic acid, and increasing muscle function. respiratory blood. For a normal person, the heart rate per minute ranges between 60-80 beats/minute. A phenomenon of low heart rate is observed among sports individuals, as the rest time reaches less than 60 beats/minute (Aboulaala & Nasreddine, 1993, 43), as Aiouad & Sahir (2017, 57) indicated that multiple studies have confirmed an improvement in the average heart rate during the resting period of the athletes who train in the state of hypoxia, so the training method modifies the ability of the heart muscle to pump blood to the rest of the body (Guellati &Ghanem, 2018). However, the method of training does not depend on how to do the physical effort only, but

the type of rest after the physical effort also affects the variable of the natural resting pulse (Aouadi & Kabouya, 2021; Naghal, 2014a; Farhani, 2015; Abdoulhak & Naghal, 2021; kedraoui, 2018; Naghal, 2014b). Hence, we can rely on the resting heart rate index in the process of sports selection for young talents, especially in sports that depend on the quality of endurance (Belmiloud and Haceini, 2021).

Through the interpretation of the results of the tables related to the second partial question, we found that the training mask improves the physical recovery of the athletes. The heart is the source of energy for the movement of blood within the blood vessels. The atria connect to the ventricles and from there to the pulmonary veins and arteries thanks to valves located at the inner and outer openings of the ventricles, and the closing or opening of the valves is related to the amount of pressure on both sides (Talha, 1994, 148). There are factors that help detect the development of the heartbeat, including the ability of the player to resynthesize phosphocreatine, the ability of cellular oxidation, as well as the biochemical balance in the acid base (Rettal, 2006,1032). Where Chetioui & Guellati (2019, 262) concluded through their studies that the players had a relative improvement in the physiological and functional efficiency of the circulatory system after hypoxy training, and another study indicated an improvement in both the aerobic and anaerobic capacities of the athletes through the use of the training mask (Bentoumia, Bengoua & Mim, 2020), which is the same effect we see in altitude training (Gheribi, 2020; Zaoui & Medjralou, 2018). This supports the validity of our results and proves the improvement of physical recovery by using a training mask. The speed of returning the heartbeat to its normal level is considered the most important indicator of the recovery ability of the athlete (Ouali, 2021, 493). However, training at heights affects other physiological indicators that are not affected by training with a training mask. (Porcari & al., 2016). From here and by analyzing the results of these studies in addition to the results of our study, we see that the effect of training with a training mask is closer to the effect of training in the aquatic medium (Azizi & Amanallah, 2020) than the effect of training at heights.

Conclusion:

The training mask has characteristics that lie in the development of the capabilities and efficiency of the cardiac system, as the results of our study indicated the presence of positive physiological changes among its users during training, as the heart rate of the resting pulse improved, which indicates the ideal adaptation of the heart muscle, which in turn helps in developing the functional recovery of athletes ideally. With the ease of using this device due to the limited time, effort, and money, the hypoxy training has proven effective in improving the job performance of the athletes, especially if this period is prior to the official competitions (Zaoui & Medjralou, 2020), and for this reason, the trainers must be made aware of the benefits of using the training mask in their training sessions, as it must Activating larger studies in terms of the sample and the diversity of variables in order to reach scientific facts and confirm or deny what previous studies have reached on the subject. We recommend the use of the training mask as a tool for developing the cardiac capacity of sports athletes, but with respect for the principles of training (on a scientific basis).

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