Journal of Sport Science Technology and Physical Activities
ISSN : 1112-4032
eISSN 2543-3776

VOL: 20 / N°: 1 June (2023), P: 129-142

Training using adaptive sports masks and its effect on the physiological changes associated with the phenomenon of athlete's kidney among handball players

ZEMALI HASSANE
Chahid cheikh Larbi Tebessi University, Tebessa, I.S.T.P.S.A, Algeria
hassane.zemali@univ-tebessa.dz

ARTICLE INFORMATION
Original Research Paper
Received : 03/07/2022
Accepted :07/05/2023
Published : 01/06/2023

Keywords :
physical training;
training using adaptive sports masks;
physiological changes;
the phenomenon of athlete's kidney;

Corresponding author:
ZEMALI HASSANE

e-mail:
hassane.zemali@univ-tebessa.dz

Abstract

Sports training leads to numerous physiological changes that affect most body systems. Positive changes in these systems result in an improved level of athletic performance. Training requirements also lead to a set of structural and functional changes that elevate the body's functional level. This study aims to investigate the effect of sports training using adaptive sports masks on the physiological changes associated with the phenomenon of athlete's kidneys among handball players. (22) handball players were randomly selected and divided into two equally matched and homogeneous groups: an experimental group and a control group. The experimental group underwent a proposed (12) week training program, while the control group did not. Blood and urine samples were collected before and after the first and final training sessions. The results showed significant differences between pre- and post-training measurements in serum albumin, serum globulin, and glucose levels. This confirms the effective impact of physical training using adaptive sports on the physiological changes associated with the phenomenon of athlete's kidneys, resulting in improved kidney function and optimal adaptation due to training load pressure. These findings support the necessity of using adaptive sports masks in sports training programs.

1. Introduction

Sports training leads to many physiological changes that include most of the body's systems, and the level of sports achievement is raised whenever these changes are positive and therefore adaptation occurs in the body's organs as a result of the pressure of the training load or the various external pressures to perform the physical load and perform the performance with high efficiency and economy of effort and time, and What is meant by conditioning is an increase in the functional level of the body, including the structural and psychological changes of the body as a result of the requirements of pregnancy, and the utilization of physical capabilities is combined with the level of development of psychological characteristics. (Khuribet, 1997)

The issue of the impact of training on the player's body in the game of football is one of the important matters that attracts the attention of those involved in the game, and that the selection of appropriate, appropriate and organized exercises has a role in the development process of functional changes. Sports training leads to an increase in muscle capacity through special movements whose goal is to increase muscle achievement to a higher level and higher than if you trained the muscle by playing the ball only. (Al-Mawla, 1999)

The phenomenon of athlete's kidneys is a problem whose symptoms appear after long-term and high-intensity training, although it does not represent a pathological condition, it can cause many health problems and pain that accompany the process of high-intensity training, which can affect the performance of the athlete, which necessitates us to find solutions for that.

Since the specified requirements and nature of competition in any sport impose special physical, skillful, and strategic abilities on its practitioners, they also require the availability of certain functional capabilities and physiological characteristics for each type of sport. And since the need to achieve great accomplishments requires attention to indicators related to achievement, including physical factors that require targeted measures to demonstrate, develop, and direct them, sports training experts have paid special attention to various aspects of physical training and sports

competitions. As a result, several studies and research have emerged that accurately address the topic of the effect of physical training on kidney function. (Poortmans, 2015), (Bennett, and al., 2016), (Hamada, and al., 2016), (Böhm, and al., 2017), (Hiraki, and al., 2017), (Fuhro, and al., 2018), (Belik, an al., 2018), (Kirkman, and al., 2018), (Suzuki, and al., 2018), (Watson, and al., 2018), (Dashtidehkordi, and al., 2019), (Nilsson, and al., 2019), (Uchiyama, and al., 2019), (Huang, and al., 2020), (Juett, And al., 2020), (Bekachout, and al., 2021), (Daniel, and al., 2021), (Lakicevic, and al., 2021), (Anthony, and al., 2022).

Based on the foregoing, this research problem was formed and formulated in the following main question:

- Does training using adaptive sports masks affect the reduction in the level of physiological changes associated with the phenomenon of athlete's kidneys among the players of the experimental sample compared to the players of the control sample?

1.1. Literature Review.

More specifically, experimental studies indicate that changes in urine following training loads are often due to conditions of oxygen depletion in the blood that the body, and especially the kidneys, experience when blood flow to them is reduced due to training efforts. This causes the renal filters to widen, allowing relatively large components to appear in the urine. Additionally, intense efforts, violent physical performance, and collisions that athletes may encounter can lead to a type of breakdown of red blood cells, which can also appear in the urine. However, it is worth noting that such changes are a temporary phenomenon following physical exertion and disappear within 24-48 hours. (Poortmans, 2015), (Bennett, and al., 2016), (Hamada, and al., 2016), (Böhm, and al., 2017), (Hiraki, and al., 2017), (Fuhro, and al., 2018), (Belik, an al., 2018), (Kirkman, and al., 2018), (Suzuki, and al., 2018), (Watson, and al., 2018), (Dashtidehkordi, and al., 2019), (Nilsson, and al., 2019), (Uchiyama, and al., 2019), (Huang, and al., 2020), (Juett, And al., 2020), (Bekachout, and al., 2021), (Daniel, and al., 2021), (Lakicevic, and al., 2021), (Anthony, and al., 2022).

Now, considering the dual role of exercise in health, also based on all of the above, the need to conduct this research, whose general objective lies in recognizing the importance of training using adaptive sports masks in a positive way, in reducing the level of physiological changes associated with the phenomenon of athlete's kidneys, including achieving high sports results and optimal sports orientation

2. Method and Materials

After conducting the exploratory experiment, and after verifying the validity of the scientific transactions of the tests and standards, as well as the validity of the training program using adaptive sports masks and its suitability to the research sample, roles were distributed to the assistant work team, followed by the start of the process of implementing the main experiment in the period from september 2021 until april 2022.

2.1. Participants

Our research community was represented in (male) handball players aged (23-27) years in the state of Tebessa, during the sports season 2021/2022.

While the research sample included (male) handball players aged (23-27) years in Amal Hammamet Club in the state of Tebessa, where the number was estimated at (22) players, whereas this sample constitutes (11.11%) of the population of origin represented in (male) handball players in Tebessa, at ages (23-27) years, and their number is (198) players, during the sports season 2021/2022.

This sample was chosen randomly, and it was divided into two equal and homogeneous groups, each of which includes (11) players: an experimental group and a control group.

Whereas, the sample of the exploratory experiment included the players of the Amal Hamamat club, aged 17-19 years, and they numbered 06 players.

2.2. Materials

In order to obtain the results, the researcher relied in this study on a set of tools and means to collect raw data, which were as follows:

- Theoretical analysis: from various Arab and foreign references in order to extract the largest possible amount of theoretical information that allows limiting the subject of the study.

- Human means: relying on a group of qualified people with experience and expertise to help implement the training program and medical measurements, in order to gain time and effort.

- Training program using adaptive sports masks with trade mark (Phantom).

- Medical measurements and analyzes for the purpose of taking blood and urine samples from players.

2.3. Design and Procedure

The researcher used the experimental design using the two equal groups with the pre- and post-test, with random selection, where in this design the experimental factor, which is the training program, using adaptive sports masks with trade mark (Phantom), is introduced to the experimental group, and the control group is left in its usual conditions.

Where the experimental group is subjected to a high-intensity training program with an estimated load of (80%), with a change in the interval rest between each exercise and another, at a rate of two sessions per week for a period of (12) weeks, with the increase in the resistance of the conditioned mask from beginner to advanced after two weeks, from advanced to professional after two weeks, and from professional to extreme after two weeks. Also the raw statistical data is taken as follows:

- Pre-measurement: Before the first training session
- Post-measurement: after the last training session

2.4. Statistical Analysis

The statistical package for the social sciences, 16th edition **(spss v. 16.0)** was used in the statistical treatment.

Table 01. shows the statistical tools used:

For inferential statistics we used:	For descriptive statistics we used:
- (T) Student. - Correlation coefficient (Pearson). - skew modulus. - Spearman-Brown stability coefficient.	- SMA. - standard deviation. - Repetitions.

3. Results

3.1. Presentation and analysis of the results of the 1st hypothesis:

Table 02. shows the values of the differences between the arithmetic mean of the total frequencies of the post-follow-up measurement of the two experimental and control samples with regard to medical analyzes of serum albumin in urine:

Measurement / Variable	the group	SMA	standard deviation	Calculated T	probability	degree of freedom	Indication level	The result
serum albumin	Exp	132	14.82	7.59	0.000	20	0.01	** Significant
	Con	317	37.76					

*** Significant at the error rate (05%). /Table-T-value: at the level of significance (0.01) = 2.528**
**** Significant at the error rate (01%).**

As shown in Table 02, and based on the comparison between the arithmetic averages of the total frequencies of the post-follow-up measurements of the two control and experimental samples with regard to serum globulin in urine, there are significant differences between the averages of the control and experimental group in favor of the experimental sample, and what confirms this is that calculated t values **(7.59)** is greater than the tabular t-value estimated at (**2.528)** at the significance level of 0.01 and the degree of freedom of **(20)**, and what proves this is the probability values **(0.000)** which is less than the value **(0.01)** (the significance level).

3.2. Presentation and analysis of the results of the 2nd hypothesis:

Table 03. shows the values of the differences between the arithmetic mean of the total frequencies of the post-follow-up measurement of the two experimental and control samples with regard to medical analyzes of serum globulin in urine:

Measurement / variable	the group	SMA	standard deviation	Calculated T	probability	degree of freedom	Indication level	The result
serum globulin	Exp	119	12.85	5.72	0.000	20	0.01	** Significant
	Con	278	19.43					

*** Significant at the error rate (05%). /Table-T-value: at the level of significance (0.01) = 2.528**
**** Significant at the error rate (01%).**

As shown in Table 03, and based on the comparison between the arithmetic averages of the total frequencies of the post-follow-up measurements of the two control and experimental samples with regard to serum globulin in urine, there are significant differences between the averages of the control and experimental group in favor of the experimental sample, and what confirms this is that calculated t values **(5.72)** is greater than the tabular t-value estimated at (**2.528)** at the significance level of 0.01 and the degree of freedom of **(20)**, and what proves this is the probability values **(0.000)** which is less than the value **(0.01)** (the significance level).

3.3. Presentation and analysis of the results of the 3rd hypothesis:

Table 04. shows the values of the differences between the arithmetic mean of the total frequencies of the post-follow-up measurement of the two experimental and control samples with regard to medical analyzes of glucose in urine:

Measurement / variable	the group	SMA	standard deviation	Calculated T	probability	degree of freedom	Indication level	The result
glucose	Expl	84	07.63	5.18	0.000	20	0.01	** Significant
	Con	141	21.49					

*** Significant at the error rate (05%). /Table-T-value: at the level of significance (0.01) = 2.528**
**** Significant at the error rate (01%).**

As shown in Table 04, and based on the comparison between the arithmetic averages of the total frequencies of the post-follow-up measurements of the two control and experimental samples with regard to serum globulin in urine, there are significant differences between the

averages of the control and experimental group in favor of the experimental sample, and what confirms this is that calculated t values **(5.18)** is greater than the tabular t-value estimated at (**2.528)** at the significance level of 0.01 and the degree of freedom of **(20)**, and what proves this is the probability values **(0.000)** which is less than the value **(0.01)** (the significance level).

4. Discussion:

After statistical treatment using the appropriate statistical methods, as well as presenting the obtained results and discussing them statistically, we reached the positive effect of training using adaptive sports masks on the physiological changes associated with the phenomenon of athlete's kidneys, where the evidence is we note the validity of the first hypothesis (there are significant differences between the pre and post measurements of the amount of serum albumin in the urine of the players of the experimental sample compared to the control sample, in favor of the experimental sample), also, We note the validity of the second hypothesis (there are significant differences between the pre and post measurements of the amount of serum globulin in the urine of the players of the experimental sample compared to the control sample, in favor of the experimental sample.), and we note the validity of the third hypothesis (there are significant differences between the pre and post measurements of the amount of glucose in the urine of the players of the experimental sample compared to the control sample, in favor of the experimental sample.)

The results of this study are confirmed by the results of previous studies, represented in the study (Poortmans, 2015), (Bennett, and al., 2016), (Hamada, and al., 2016), (Böhm, and al., 2017), (Hiraki, and al., 2017), (Fuhro, and al., 2018), (Belik, an al., 2018), (Kirkman, and al., 2018), (Suzuki, and al., 2018), (Watson, and al., 2018), (Dashtidehkordi, and al., 2019), (Nilsson, and al., 2019), (Uchiyama, and al., 2019), (Huang, and al., 2020), (Juett, And al., 2020), (Bekachout, and al., 2021), (Daniel, and al., 2021), (Lakicevic, and al., 2021), (Anthony, and al., 2022).

Many of the studies examined the effect of different types of exercise on the quality of life and functional capacity of players with different stages of athlete's kidney. Most of these studies confirmed the positive effect of exercise on functional capacity. (Hamada, and al., 2016), (Watson, and

al., 2018), (Dashtidehkordi, and al., 2019), (Bennett, and al., 2016), (Uchiyama, and al., 2019), (Hiraki, and al., 2017), (Nilsson, and al., 2019), (Suzuki, and al., 2018)

The researcher attributes this to the fact that training using adaptive sports masks plays an important role in reducing the amount of serum albumin in the urine, by improving the effectiveness of the kidneys during a lack of oxygen level, this confirmed by studies of that Exercise and physical activity lead to changes in kidney hemodynamics and electrolytes. (Böhm, and al., 2017), (Belik, an al., 2018), (Huang, and al., 2020)

Furthermore, the researcher attributes this to the functional improvement that occurred in the cardiovascular system as a result of the aerobic activities that lead to the expansion of the four chambers of the heart and an increase in the thickness of the left ventricular wall, and thus the increase in the volume of cardiac output in each stroke. The physiological increase in the size of the heart occurs as a result of maintenance training. (Bekachout, and al., 2021)

In this sense, (Kleiman, 1960) indicates that these changes are often due to the conditions of lack of oxygen in the blood that the body is exposed to in general and the kidneys in particular when blood flow to it decreases due to physical exertion, which works to widen the renal filters, so these components appear relatively large in size the blood. (Juett, And al., 2020)

Also, as a result of intense efforts, violent physical performance, and the types of collisions that athletes encounter, they may lead to a kind of breakdown of red blood cells and appear in the urine. However, it is worth noting that such changes are a temporary phenomenon after physical effort and soon disappear within 24-48 hours. (Daniel, and al., 2021)

Furthermore, kidneys and collecting ducts, muscles, and the cardiorespiratory system are among the body organs that change the way they work due to exercise. (Böhm, and al., 2017), (Fuhro, and al., 2018), (Kirkman, and al., 2018)

5. Conclusion

To sum up, from the above we conclude The effectiveness of training using adaptive sports masks in reducing the level of physiological changes associated with the phenomenon of athlet's kidneys among the players of the experimental sample.

Researchers have interpreted the changes in urine following training loads based on what (Kleiman) called the "athlete's kidney" phenomenon. These changes are often due to conditions of oxygen depletion in the blood that the body, and especially the kidneys, experience when blood flow to them is reduced due to training efforts. This causes the renal filters to widen, allowing relatively large components to appear in the urine. Additionally, intense efforts, violent physical performance, and collisions that athletes may encounter can lead to a type of breakdown of red blood cells, which can also appear in the urine. (Poortmans, 2015), (Bennett, and al., 2016), (Hamada, and al., 2016), (Böhm, and al., 2017), (Hiraki, and al., 2017), (Fuhro, and al., 2018), (Belik, an al., 2018), (Kirkman, and al., 2018), (Suzuki, and al., 2018), (Watson, and al., 2018), (Dashtidehkordi, and al., 2019), (Nilsson, and al., 2019), (Uchiyama, and al., 2019), (Huang, and al., 2020), (Juett, And al., 2020), (Bekachout, and al., 2021), (Daniel, and al., 2021), (Lakicevic, and al., 2021), (Anthony, and al., 2022).

From the aforementioned, we confirm the technical development of sports training at the scientific level and its connection with the theories of other sciences and their bases on which it depends in its knowledge, information and various methods. (Idir and Rezoug, 2021)

As it became a coherent mixture of other sciences and the seeds of this science appeared in scientific references that made great qualitative leaps in the field of sports and is still striving to achieve the best in the science of sports training for individuals to reach the highest level of sports in terms of comprehensive numbers in all respects.

So, sports training based on scientific foundations is the best and only method to increase energy expenditure and reduce the percentage of fat in the body and improve the physiological indicators that the resulting activity becomes a lifestyle. (Dakhia, 2021)

In this regard, a key issue that physicals trainers and instructors should clearly take care to build on sound and fair scientific foundations would be the development of aerobic and anaerobic metabolism to enhance recovery and adaptation (RA) at the physiological level after the training exercises. (Marouf, 2021)

Finally, we emphasize that investing in health reduces the burden of disease and works to produce results that benefit society. (Ben dhiba, 2021)

Based on the foregoing, the researcher recommends the necessity of relying on Training using adaptive sports masks and allocating classes within the training program because of its benefits in improving physical conditions and functional efficiency.

References:

- Al-Mawla, Muwaffaq Majeed, (1999). Career numbers in football, i 1, *Dar Al-Fikr for printing, publishing and distribution*, Amman, Jordan, P 98.

- Anthony Meade, Carla McLaren ,Paul N. Bennett, (2022). Combining exercise and nutrition in chronic kidney disease and dialysis: Can we learn from the performance nutrition of athletes?, *Wiley Online Library*, doi.org/10.1111/sdi. 13060.

- Bekachout, A., Adda, O., Sami, A., (2021). Cardiorespiratory fitness and some health-related anthropometric variables among adolescents studying in Chlef city at the age of (15-18) years, *Scientific journal of science and technology for physical and sports activities*, Institute of Physical Education and Sports, univ-mostaghanem, Vol 18, Issue 02, PP 274-291.

- Belik, F.S.; Silva, V.R.O.E.; Braga, G.P.; Bazan, R.; Vogt, B.P.; Caramori, J.C.T.; Barretti, P.; de Souza Gonçalves, R.; Bôas, P.J.F.V.; Hueb, J.C, (2018). Influence of intradialytic aerobic training in cerebral blood flow and cognitive function in patients with chronic kidney disease: A pilot randomized controlled trial. *Nephron*, 140, PP 09–17.

- Ben dhiba, Djourdem, (2021). Regulating aerobic endurance activities in improving some health-related physical abilities in the elderly (50-60) years, *Journal of sport science technology and physical activities*, Institute of Physical Education and Sports, univ-mostaghanem, Volume 18, Issue 02, PP 292-304.

- Bennett, P.N.; Fraser, S.; Barnard, R.; Haines, T.; Ockerby, C.; Street, M.; Wang, W.C.; Daly, R, (2016). Effects of an intradialytic resistance training programme on physical function: A prospective stepped-wedge randomized controlled trial. *Nephrol*. Dial. Transplant, 31, PP 1302–1309.

- Böhm, J.; Monteiro, M.B.; Andrade, F.P.; Veronese, F.V.; Thomé, F.S, (2017). Acute effects of intradialytic aerobic exercise on solute removal, blood gases and oxidative stress in patients with chronic kidney disease. J. Bras. *Nefrol*, 39, PP 172–180.

- Dakhia, Adel, (2021). The effect of aerobic training on improving some physiological indicators in the elderly with arterial hypertension, *Journal of sport science technology and physical activities*, Institute of Physical Education and Sports, univ-mostaghanem, Vol 19, Issue 01, PP 245-264.

- Daniel, R. V., Braulio, S. U., Jennifer, C., Rafael, T., Guillermo, J. O., (2021). Exertional rhabdomyolysis and acute kidney injury in endurance sports: A systematic review, Vol 21, Issue 2, PP 261-274.

- Dashtidehkordi, A.; Shahgholian, N.; Attari, F, (2019). Exercise during hemodialysis and health promoting behaviors: A clinical trial. BMC *Nephrol*, 20, P 96.

- Fuhro, M.I.; Dorneles, G.P.; Andrade, F.P.; Romão, P.R.T.; Peres, A.; Monteiro, M. B, (2018). Acute exercise during hemodialysis prevents the decrease in natural killer cells in patients with chronic kidney disease: A pilot study. Int. Urol. *Nephrol*, 50, PP 527–534.

- Hamada, M.; Yasuda, Y.; Kato, S.; Arafuka, H.; Goto, M.; Hayashi, M.; Kajita, E.; Maruyama, S, (2016). The effectiveness and safety of modest exercise in Japanese patients with chronic kidney disease: A single-armed interventional study. *Clin. Exp. Nephrol*, 20, PP 204–211.

- Hiraki, K.; Shibagaki, Y.; Izawa, K.P.; Hotta, C.; Wakamiya, A.; Sakurada, T.; Yasuda, T.; Kimura, K, (2017). Effects of home-based exercise on pre-dialysis chronic kidney disease patients: A randomized pilot and feasibility trial. *BMC Nephrol*, 18, P 198.

- Huang, M.; Lv, A.; Wang, J.; Zhang, B.; Xu, N.; Zhai, Z.; Gao, J.; Wang, Y.; Li, T.; Ni, C, (2020). The effect of intradialytic combined exercise on hemodialysis efficiency in end-stage renal disease patients: A randomized-controlled trial. *Int. Urol. Nephrol*, 52, PP 969–976.

- Idir, Iddir, Rezoug, Laiche, (2021). Periodization of the training load through a preparatory season for high-level Algerian Judokas, *Journal of sport science technology and physical activities*, Institute of Physical Education and Sports, univ-mostaghanem, Vol 19, Issue 01, PP 245-264.

- Juett L.A., James L.J., Mears S.A., (2020). Effects of Exercise on Acute Kidney Injury Biomarkers and the Potential Influence of Fluid Intake, Annals of Nutrition and Metabolism, 76 (suppl 1), PP 53–59.

- Khuribit, Raysan Majeed, (1997). General Theories in Sports Training, *Dar Al-Shorouk for Publishing and Distribution*, Jordan, P 325.

- Kirkman, D.; Muth, B.; Stock, J.; Townsend, R.R.; Edwards, D.G, (2018). Cardiopulmonary exercise testing reveals subclinical abnormalities in chronic kidney disease. *Eur. J. Prev. Cardiol*, 25, PP 1717–1724.

- Lakicevic, N., Paoli, A., Roklicer, R., Trivic, T., Korovljev, D., Ostojic, S.M., Proia, P., Bianco, A., Drid, P., (2021). Effects of Rapid Weight Loss on Kidney Function in Combat Sport Athletes, *Medicina*, 57, P 551.

- Marouf, Said, (2021). Effect of Training in zone 5 (Redline zone) on Developing Repeated-Sprint Ability (RSA) in U19 football players, *Journal of sport science technology and physical activities*, Institute of Physical Education and Sports, univ-mostaghanem, Vol 18, Issue 01, PP 143-153.

- Nilsson, B.B.; Bunæs-Næss, H.; Edvardsen, E.; Stenehjem, A.-E, (2019). High-intensity interval training in haemodialysis patients: A pilot randomised controlled trial. *BMJ Open Sport Exerc. Med.* , 5, e000617.

- Poortmans, J. R., Jeannaud, F., Baudry, S., Carpentier, A., (2015). Changes in Kidney Functions during Middle-distance Triathlon in Male Athletes, *Int J Sports Med*, 36 (12), PP 979-983, doi: 10.1055/s-0034-1398681.

- Suzuki, T.; Ikeda, M.; Minami, M.; Matayoshi, Y.; Nakao, M.; Nakamura, T.; Abo, M, (2018). Beneficial Effect of Intradialytic Electrical Muscle Stimulation in Hemodialysis Patients: A Randomized Controlled Trial. *Artif. Organs*, 42, PP 899–910.

- Uchiyama, K.; Washida, N.; Morimoto, K.; Muraoka, K.; Kasai, T.; Yamaki, K.; Miyashita, K.; Wakino, S.; Itoh, H, (2019). Home-based Aerobic Exercise and Resistance Training in Peritoneal Dialysis Patients: A Randomized Controlled Trial. *Sci. Rep*, 09, PP 26-32.

- Watson, E.L.; Gould, D.W.; Wilkinson, T.J.; Xenophontos, S.; Clarke, A.L.; Vogt, B.P.; Viana, J.; Smith, A.C, (2018). Twelve-week combined resistance and aerobic training confers greater benefits than aerobic training alone in nondialysis CKD. *Am. J. Physiol. Physiol*, P 314, F1188–F1196.