



PROCEEDING THE 5TH ICSDP



International
Conference
of Sport
for Development
and Peace

The 5th International Conference of Sport for Development and Peace in Collaboration with 2022 International Conference of Sport History and Culture

THE EFFECT OF VISUAL IMAGERY WITH 3D VIRTUAL REALITY ON HEART RATE REDUCTION

Pramita Nainggolan^{1*}, Surdiniaty Ugelta²,

*Corresponding e-mail: pramitanainggolan@gmail.com

*Corresponding address:

¹Sport Science, Faculty of Sport and Physical Education, Universitas Pendidikan Indonesia

²Sport Science, Faculty of Sport and Physical Education, Universitas Pendidikan Indonesia

Abstract

The purpose of this study is to determine that there is an effect of visual imagery with 3D virtual reality on reducing heart rate. In maintaining homeostasis, coaches must understand to use recovery techniques according to the needs of athletes so that athletes have good quality in their performance. There are 10 athletes of UKM Futsal UPI as the sample in this study. This research method uses pre –post test control group design. The instruments used are Polar Heart Rate Monitor and Cunningham and Faulkner Test. The results obtained from the statistical analysis of Paired Sample T Test in the experimental group sig. $p = 0.000 < 0.05$ then H_0 is rejected, means there is difference in average pulse rate after and before recovery visual imagery, in the control group sig. $p = 0.000 < 0.05$ then H_0 is rejected, means there is difference in average pulse rate in the pre - post control group test. The results obtained from the Independent Sample T Test Statistical analysis sig. $p = 0.441$ or $0.441 > 0.05$ then H_0 is accepted, means that there is no difference in the average pulse rate after and before recovery with visual imagery and passive recovery (control), so the result of this study is that there is no effect of visual imagery treatment with 3D virtual reality on reducing heart rate.

Keyword: visual imagery, heart rate, fatigue



APASS
Asia-Pacific Association of Sport Studies



ASIAN JOURNAL OF
Sport History
& Culture



Taylor & Francis
Taylor & Francis Group



PROCEEDING THE 5TH ICSDP



International
Conference
of Sport
for Development
and Peace

The 5th International Conference of Sport for Development and Peace in Collaboration with 2022 International Conference of Sport History and Culture

Introduction

Light or high exercise will cause fatigue. Fatigue affects the physiological work of the body and also feeling tired increases the heart rate because the heart muscle works faster to circulate oxygen. According to McArdle et al (1994, p. 292) also explains that "muscle fatigue can result from several factors, there are four main components involved in muscle contraction, namely 1) Central nervous system, 2) Peripheral nerves, 3) Neuromuscular junction 4) muscle fiber. Methods of physical and mental recovery of athletes in order to restore athletes in good condition homeostasis referred to as recovery. According to WShCouncil (2010) the type of fatigue is divided into: a) Physical fatigue (reduced ability to work manually), b) Mental fatigue (decreased level of concentration and alertness).

Fatigue occurs in the central nervous system because the regeneration of nerve cells is 7 times lower than that of muscle cells, more attention should be directed to recovery psychological nerves. When the CNS (Central Neural System) is restored, athletes will contract better, skill performance will be more precise, react faster, be more energetic to stimuli both from outside and from within, and definitely maximize work capacity (Matjan, 2007 p. 22). Prevention of psychological fatigue by looking at and considering the basics of motivation, fatigue is the result of normal training, dealing with stress and frustration, training models to adapt to various match situations and the importance of the climate of the team or team composition. The most efficient way is the treatment of fatigue through suggestions from the trainer, self-suggestion and psychonic exercises. Speed up the process recovery after exercise and maintain the physical and psychological condition in the highest status.

According to Hauswirth and Mujika (2013, p. 44) states that "The questionnaire identified athletes whose stress recovery is inadequate, given the intensity of the training-induced workload. The emphasis is placed, not on reducing the training level, but on increasing the quality and quantity of recover" From the explanation above, it is explained that the reduction of stress is not by reducing exercise but by increasing the quality and quantity of recovery, the more programmed the athlete's recovery, the more quality the athlete's recovery process will be. Use of recovery to lower the athlete's heart rate to return to the resting heart rate.

Griwijoyo (2010, p. 269) said that "The return of homeostatic conditions to normal conditions". Which means the return of the physical condition to its original or normal state after carrying out activities that can cause fatigue to the athlete's physical condition. Stages of recovery or the return of the body in a state of homeostasis There are various techniques based on sports science and technology including: recovery experience, recovery physiotherapeutic and recovery psychologically, as well as consuming drinks or foods that have been proven to restore the body to a stable state. By giving technique recovery heart rate can return to its initial state, "The speed of the heart rate is determined by the speed of the SA node's electrical signal, it is slow, but when physical and emotional activity



PROCEEDING THE 5TH ICSDP



International
Conference
of Sport
for Development
and Peace

The 5th International Conference of Sport for Development and Peace in Collaboration with 2022 International Conference of Sport History and Culture

increases, the speed of the SA node's signal will also increase, so that the heart rate becomes faster" (Edward. 2000).

"Visual imagery is the mental invention or recreation of a visual-perceptual experience in the absence of retinal input" (Alumit and Dov., 1997, p. 476). Mental that is created from what is seen visually and makes a person experience a recreation of the experience received by the sense of sight. According to Williams and Carey (2003, p. 6) explains that "This technique uses your mind to distract you from pain, tension, or problems. It asks you to create images in your mind that are so captivating, so rich in detail, and so all-consuming for your mind, that you get lost in the images your mind creates" Carey explains with technique visual imagery can distract athletes from pain, abnormal tension in a way athletes can imagine something beautiful.

Another statement states that recovery by visually imagining relaxation techniques when a person performs imagining relaxation accompanied by deep breathing settings to control the feeling of fatigue, the body will increase the parasympathetic nervous component stimulants, then this causes a decrease in cortisol and adrenaline hormone levels in the body. which affects a person's stress reduction so that it can increase concentration and make the client feel calm to regulate the rhythm of breathing to be regular. When a person returns to a normal state or is no longer tired, he can continue activities with a fit body.

The object causes the stimulus to enter through the senses or receptors, the sense organs are the tools that receive the stimulus, after the receptor receives the stimulus, the stimulus is sent to the central nervous system, the central nervous system is the center of consciousness through sensory nerve cells and to produce a response, nerve cells are needed. motorized. The autonomic motor nerves are also known as the parasympathetic nerves. When the nerves work in providing calm, the parasympathetic nerves work, as stated by Puspitawati and Hapsari (2012, p. 22) explaining that "The function of the Parasympathetic Nerve is to store energy in the body and react in the face of pleasant situations".

Visual imagery has a good effect on psychology because the impulses carried by the nerves are received by the brain so that the heart gives the effect of decreasing the pulse rate and recovery can be realized. 3D Virtual reality Samsung uses a mobile phone that supports it to watch videos that can relax oneself and release muscle tension, with an appropriate time of 10 – 20 minutes.

Methods

The participants in this study were 10 students of sports science who actively played futsal and participated in the national futsal competition. Subjects will be divided into two groups, namely groups recovery visual imagery and control group. Before giving treatment to each group, the researcher gave the research procedure.

The quantitative research method applied in this research is experimental. "The experimental method can be interpreted as a research method used to find the effect of certain treatments on others under controlled conditions" (Sugiyono, 2016, p.72). The type of experimental method used is pretest posttest control group



APASS
Asia-Pacific Association of Sport Studies



ASIAN JOURNAL OF
Sport History
& Culture



Taylor & Francis
Taylor & Francis Group



PROCEEDING THE 5TH ICSDP



International
Conference
of Sport
for Development
and Peace

The 5th International Conference of Sport for Development and Peace in Collaboration with 2022 International Conference of Sport History and Culture

design, where the researcher tried to test the difference in the decrease in pulse rate on the initial test and the post-test after being given treatment Recovery (visual imagery) and control group.

Sugiyono (2016, p. 102) that "Research instrument is a tool used to measure observed natural and social phenomena. Specifically, all of these phenomena are called research variables. The research instruments used in this study were the Polar Heart Rate Monitor and the Cunningham and Faulkner Test. Polar Heart Rate Monitor which has benefits, one of which is to monitor the heart work and heart rate of athletes and Cunningham and Faulkner Test is a test instrument to stimulate an increase in heart rate. So, the measuring instrument material is really a representative material for the measurement material.

Research procedures are very important to complete a study. The existence of research procedures as a direction or strategy during carrying out research from determining samples and populations to the existence of research results, all of which are arranged with a clear and accurate plan. The steps of this research are also directed according to the research design used.

The research will not be completed or ended if there is no data to be processed. The process of taking in this study is divided into several stages of tests, namely:

a. Test Cunningham and Faulkner

Test Cunningham and Faulkner is a test instrument to evaluate capacity anaerobic. Researchers used the test to stimulate an increase in pulse rate.

b. Initial Pulse Test

The initial pulse test is carried out immediately after the sample carries out the Test Cunningham and Faulkner. The first pulse test serves to determine the calculation of the accumulated pulse.

c. Recovery psychology

Giving recovery as a method for lowering the pulse, the method used in this study is watching videos in 3D format using 3D technology Virtual reality, watch the video for 10 minutes. This method is given to relax a person's psychological fatigue and will facilitate a decrease in pulse rate.

d. Last Pulse Test

The last pulse test is carried out immediately after the sample is given the method visual imagery. The last pulse test serves to get a calculation of the decrease in pulse rate after being given treatment.

After the data was obtained, the researchers carried out data processing and data analysis. Data processing and analysis is carried out with the help of software SPSS version 22 by using paired simple t-test. After that, a two-group difference test (visual imagery and control) using analytical techniques independent sample t-test.

Result



PROCEEDING THE 5TH ICSDP



International Conference of Sport for Development and Peace

The 5th International Conference of Sport for Development and Peace in Collaboration with 2022 International Conference of Sport History and Culture

This study tries to see the effect of visual imagery with 3D virtual reality to a decrease in heart rate. It is important for athletes and sports coaches to know aspects of recovery because if the sports coach provides a technique or method, recovery that are in accordance with the needs of athletes, it will support the performance athlete. From giving visual imagery which is the method recovery wanted to see its effect on decreasing heart rate.

Measurements or instruments to collect data from this study using Cunningham and Faulkner test with the appropriate protocol with the variable to be measured. Meanwhile, to find out the pulse rate before being treated and after being treated using polar heart rate monitor which automatically generates a sample pulse count calculation.

From the data obtained in the field, it can be seen that the average value of the initial test and final test of the experimental group given the treatment visual imagery are 92,914 and 64,686 that is experiencing a decrease in pulse rate with a significance/probability value of 0.000 or $0.000 < 0.05$.

Table 1. Hypothesis test-paired sample t-test

		Mean	St. Deviation	t	Sig. (2-tailed)
Pair 1	Pretest-posttest	78.800	11.367	15.502	.000

While the mean scores of the pre-test and post-test of the untreated control group *visual imagery* are 86.965 and 59.035, which is a decrease in pulse rate with a significance/ probability value of $0.000 < 0.05$, a smaller probability value indicates that H_0 is rejected and H_a is accepted.

Table 2. Paired sample t-test hypothesis test

		Mean	St. Deviation	t	Sig. (2-tailed)
Pair 1	Pretest - Posttest	73.000	11.247	14.513	.000

When the H_0 position is rejected, it means that there is a difference in the average pulse rate pretest and posttest in the experimental group and the control group. Significance value independent sample t-test both groups are $0.441 > 0.05$, the greater the probability value indicates that H_0 is accepted and vice versa H_a is rejected. From these data, the answer to this research question is that there is no difference in the average pulse rate after and before recovery visual imagery and passive recovery (control).

These results were achieved from the results of the treatment given to each



APASS
Asia-Pacific Association of Sport Studies



ASIAN JOURNAL OF
Sport History
& Culture



Taylor & Francis
Taylor & Francis Group



PROCEEDING THE 5TH ICSDP



International
Conference
of Sport
for Development
and Peace

The 5th International Conference of Sport for Development and Peace in Collaboration with 2022 International Conference of Sport History and Culture

group, namely doing anaerobic exercise with an intensity (60-90% maximum pulse rate) with a treadmill height (incline) of 20% and a speed of 12.9km/h, then checking the initial pulse rate then treatment visual imagery was given to the experimental group and to the control group only treatment recovery passively after which the final pulse rate was measured. Based on the data obtained by the research procedure process, it is known that there is no significant effect of treatment visual imagery with 3Dvirtual reality The decrease in heart rate is due to many influencing factors, such as the condition where the research is not quite so that it interferes with the athlete's concentration to enjoy videos that has been given.

The results of this study are not in line with the research of Williams and Carey (2003) which explains that the technique visual imagery can recover athletes from pain, tension that is not normal by the way athletes can imagine something beautiful from what the senses of vision receive. The research did not use 3Dvirtual reality but functionally these technological tools are to bring more into a better state real or real conditions so that a state of relaxation is more felt as described by Armadillo (2010) which states that "...virtual reality is used to create interactive scenarios which reflect real-life situations. Virtual reality e-learning can be used to simulate the way equipment responds; emulate the way machinery works or to replicate soft skills such as human actions and behavior. Anything is possible; just let your imagination go wild" from the statement explains that with Virtual Reality used to make videos that reflects real situations and this tool lets the imagination run wild from videos seen. The research of Williams and Carey (2003) was carried out with 15-20 minutes of video duration, so the effect of giving visual imagery achieved significantly.

From the results of the statistical calculations above and referring to several theories related to the increase in research variables (decreased pulse rate) and looking at the results of relevant previous studies, it can be concluded that the lack of video duration and the situation where the research is not conducive causes no significant effect visual imagery with 3D virtual reality to a decrease in heart rate.

Conclusion

The results of this study concluded that in each group, the visual imagery group and the control group there was a decrease in pulse rate in each group, the comparison value of a significant decrease in pulse rate between the visual imagery group and the control group stated that there was no significant difference. Therefore, this study resulted, there was no effect visual imagery with 3Dvirtual reality to a decrease in heart rate.

The coaches or practitioners of achievement sports are recommended not to apply the method recovery visual imagery using 3D technology tools Virtual Reality, because using Virtual 3D does not affect the decrease in the athlete's heart rate.

In connection with the research that has been carried out and in order to improve the results of the research, the following are recommendations for future



PROCEEDING THE 5TH ICSDP



International
Conference
of Sport
for Development
and Peace

The 5th International Conference of Sport for Development and Peace in Collaboration with 2022 International Conference of Sport History and Culture

research and development of sports: Further researchers are not recommended to continue research related to 3D Virtual Reality to decrease heart rate, can continue visual imagery research with the help of other technological tools and besides that further research can increase the number of samples more

References

- Armadillo. (2010). The Benefits of Virtual Reality and 3D Simulation: <http://www.skills2learn.com/virtual-reality-benefits.html>. Retrieved June 10, 2017.
- Council, W. (2010). Workplace safety & health guidelines. From Fatigue management: <https://www.wshc.sg/wps/themes/html/upload/cms/file/Fatigue%20Management.pdf>. Retrieved Mei 15, 2017.
- Edward R. Laskowski, M. D. (2000). Physical Medicine and Rehabilitation Specialist. Oxford. Giriwijoyo. (2010). Ilmu Faal Olahraga. Bandung: Fakultas Pendidikan Olahraga dan Kesehatan Universitas Pendidikan Indonesia.
- Hapsari dan Puspitasari. (2012). Psikologi Faal. Bandung: PT Remaja Rosdakarya.
- Matjan, B. N. (2007). Ilmu Kesehatan Olahraga. Bandung: Buku ajar FPOK UPI.
- McArlde, W. D. (1994). Exercise Physiology: Energy, Nutrition and Human Performance. Baltimore, Maryland: Williams & Wilkins.
- Mujika, C. H. (2013). Recovery for performance in sport. United States: Human Kinetics.
- Alumit and Dov. (1997). Visual Imagery Facilitates Visual Perception: Psychophysical Evidence. *Cognitive Neuroscience*, 9:4, pp. 476-489.
- Sugiyono. (2016). Metode Penelitian Kuantitatif, Kualitatif dan R & D. Bandung: Alfabeta.
- Williams, D. A and Carey, M. (2003). You Really need to relax, 6.