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Acute Effect of Breathing Exercises on HRV (Heart Rate Variability) in Kick Boxers

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Abstract

The purpose of study is to measure the acute effect of 4x4 diaphragm breathing exercise on HRV of the kickboxers. For this purpose, two different measurements were carried out on 5 female and 5 male kickboxers, one without using a breathing technique and one using the 4x4 diaphragmatic breathing technique. The Inner Balance Heartmath biofeedback device was used to collect data. According to the research results, there is a statistically significant difference between the results of the pre-test and the post-test. 4x4 diaphragmatic breathing has a positive effect on the heart rate variable of kickboxers.

Keyword: Kickboxing, coherence, HRV, breath

INTRODUCTION

The history of breathing, which begins with the birth of humanity, is a physiological process that not only transports oxygen to the cells, but also connects humans to life (Önal, 2023). From the past to the present, researchers have claimed that breathing exercises have positive effects on the human body. Many studies have shown that diaphragmatic breathing relaxes the body and mind (Farhi, 1996; Hamasaki, 2020). Diaphragmatic breathing consists of intensive breathing when the abdominal cavity grows. This situation reduces the frequency of breathing. Stress and anxiety situations can be controlled with breathing exercises based on this fact. In this way, it is possible to ensure that body and mind are coherent. It is claimed that breathing exercises, when performed correctly and effectively, reduce the person's burnout and also have a positive effect on the person's cognitive performance (Ma et. all., 2017).

HRV (Heart Rate Variability) is the change in time between successive heartbeats (Shaffer & Ginsberg, 2017). History of HRV dates back to the early twentieth century, also describes the heart's ability to respond to stimulating factors in the environment. In this respect, HRV; is an important phenomenon that is also used in sport. It shows the coherence of the athlete's and can influence the performance (Triposkiadis et. all., 2009; Ateş et. all., 2021; Alvurdu, 2023).

Sport; It is a phenomenon that occurs when there is a high level of competition and stress (Şahinler & Ersoy, 2019). In order to be mentally strong during sport, mental preparation should be a high priority alongside physical exercise (Ekmekçi, 2020).
Different sports may require different physical and mental abilities. Kickboxing, especially in the category of martial arts, is a branch in which the physical and mental performance is crucial. Kickboxing; in contrast to Thai boxing and Western boxing, it is a combat sport in which kicks and punches are used for defence or attacking (kickboks.gov.tr, 2021; Boz et. all., 2023).

In kickboxing, athletes can compete in 3-4 fights per day in some competitions. In addition, the competitions generally consist of 3 rounds with 1 minute rest between rounds. Considering the physical and mental difficulties associated with kickboxing, it is important to control breathing and use correct and effective breathing techniques. For this reason, importance should rely on mental preparation techniques supported by breathing exercises to balance the autonomic nervous system and increase mental performance before, during and after the competition (Erbaş, 2022; Stepanyan & Lalayan, 2023).

Considering the physical and mental activity involved in the kickboxing and also due to the effects of HRV on the athletes, the purpose of study is to measure the acute effect of 4x4 diaphragm breathing exercise on HRV of the kickboxers.

METHODS

Research Design

A quantitative research design was preferred in this study. The experimental method with pretest-posttest control group, one of the types of quantitative research, was used.

Research Group

The research group consists of a total of 10 athletes, 5 women and 5 men, who are actively licensed kickboxers in Denizli.

Data Collection Tool

The Inner Balance Hearth Math device was used as a data collection tool in the study. This device connects to smart devices via Bluetooth and provides HRV measurements with instant real-time biofeedback via the application.

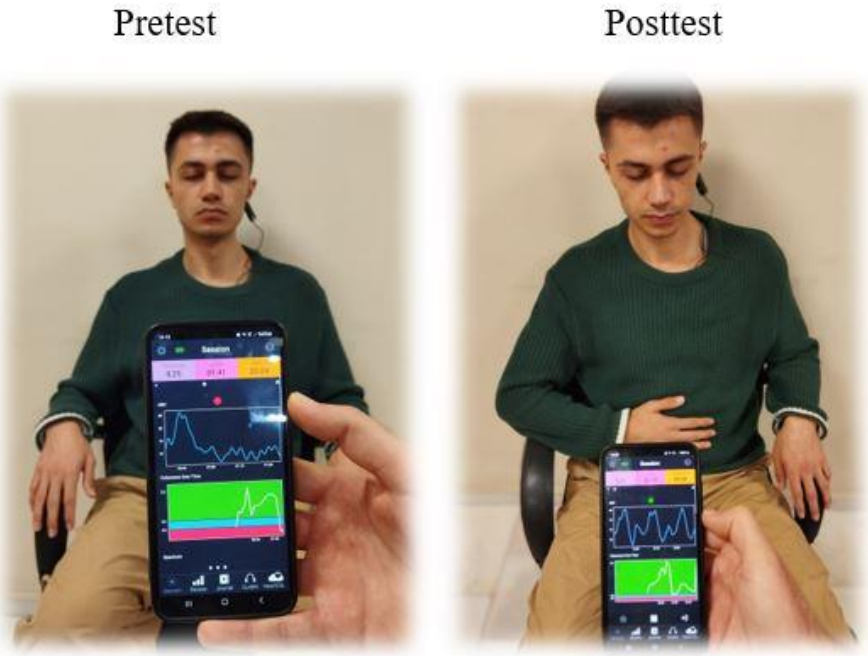

Figure 1. Example of Inner Balance Device, Application and Measurements

Experiment Process

During the experiment, the measurements were carried out in the psychophysiology laboratory of Pamukkale University, Faculty of Sports Sciences. The kickboxers were invited to the psychophysiology laboratory one by one after they had made an appointment. The measurements were based on the equality of all physical conditions. During the pre-test, 5-minute measurement were taken while the athlete was at rest, the light was switched off, the eyes were closed and no breathing techniques were used. Subsequently, 5-minute measurement were performed with 4x4 diaphragmatic breathing under the same conditions. measurements are carried out on the same chair, in the same sitting position and under the same condition.

Data Analysis

The SPSS 24 program was used to analyse the data. As the number of participants in the normality distribution was less than 50, the Shapiro-Wilk test was considered. Whether there

was a difference between the results of the pre-test and the post-test was analysed using the paired samples t-test.

FINDINGS

Table 1.1. Research Group Demographic Information

Nick Name	Gender	Age	Sports Age
Melisa	Women	18	1 Year
İrem	Women	18	1 Year
Veli	Man	18	5 Year
Ayça	Women	18	1 Year
Fatih	Man	18	1 Year
Sibel	Women	22	6 Year
Furkan	Man	20	4 Year
Emre	Man	20	8 Year
Nuri	Man	18	3 Year
Burcu	Women	20	1 Year
Mean		**19**	**3,9**

The research group consists of a total of 10 (N:10) kickboxers, 5 women and 5 men. Each athlete was given a nickname. While the average age of the athletes is 19 years, the average sports age is 3.9 years.

Table 1.2. Paired Sample T-Test Results of Kickboxers According to Heart Rate Variabilty

	N	Mean $\bar{x}$ Coherence	SD	t	p
(Pretest)	10	1,4200	,59029		
4x4 Diaphragm Breathing Exercise (Post-test)	10	2,8300	1,21751	-4,080	,003

While the pre-test coherence levels of the athletes were $\bar{x}$ = 1.4200, the post- test were $\bar{x}$ = 2.8300. According to the results of the study, there was a significant difference between the pre-test and post-test.

DISCUSSION

In this study, the pre-test results, the average coherence level of the athletes, have increased from $\bar{x} = 1.4200$ to $\bar{x} = 2.8300$ after the application of 4x4 diaphragmatic breathing. The results showed that there was a statistically significant difference between the two test results. In simpler terms, 4x4 diaphragmatic breathing has been found to have a positive effect on the autonomic nervous system of kickboxers. In kickboxing, athletes compete in more than one fight a day during a tournament and have a 1-minute break between rounds. Considering the physical and mental difficulties in kickboxing, it can be argued that breathing exercises will be beneficial for kickboxers in line with the results of the research. Some studies in the literature show that martial arts athletes use different techniques to maintain their motivation when their stress levels are high. In this process, competitive athletes, who are influenced by various internal and external factors, use different methods to motivate themselves (Boz et. all., 2023; Öztürk, 2023; Prabowo et. all., 2023; Karabulut et. all., 2013). Other studies carried out in this context show that various breathing techniques balance the autonomic nervous system (Beşler, 2023; Yılmaz, 2023; Ekmekçi & Miçooğulları, 2019; Yılmaz, 2019). Considering the results of the studies the literature on sports, they support the results of this research.

CONCLUSION

Result have shown that 4x4 diaphragmatic breathing exercise brought the kickboxers' autonomic nervous systems into balance, in other words, their coherence levels increased. Research in the literature supports these results. These results can be interpreted as an effective technique that can be used by kickboxers, considering the physical and mental difficulties of kickboxing.

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