

# Can HRV Training Make Us Happy: An Experimental Study on University Students

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## Abstract

The purpose of this study is to determine the effect of 8 weeks of HRV (Heart Rate Variability) training on the happiness and coherence levels of university students. According to this purpose, 20 sports management students from the same class volunteered to participate in the study. 10 students were selected randomly as the experimental group while the other 10 were control group. Data was collected with Oxford Happiness Inventory and Inner Balance HeartMath (biofeedback device). 8 weeks of HRV training was applied to the experiment group every night before going to sleep. After 8 weeks, the results showed a significant difference between pretest and post-test results  $p < 0.05$ . The experimental group increased their happiness and coherence while the control group decreased. In other words, the experimental group is now happier and more coherent.

**Keywords:** Happiness, HRV, Coherence, Autonomic nerve system, Biofeedback

## 1. Introduction

It is an indisputable fact that the pandemic process has created enormous economic and social effects on the world. Among the negative effects experienced in this period, psychological factors are seen as an important issue that needs to be emphasized, since they will cause different problems in the long term. Naturally, this situation has been the subject of scientific studies as it is reflected in the mental well-being of individuals (Alradhawi et al., 2020; Akat & Karatas, 2020). During the pandemic process, an important mass among those who are negatively affected are university students. Under normal circumstances, university students, who socialized in university life building their future, had to return to their families and stay home for months, and continue their university education in front of a screen. Naturally, this necessity has also created negative effects on the psychology of university students (Ceviz et

al., 2020; Cetin & Ozlem, 2020). Studies carried out during or after the pandemic are of course important and valuable. However, after the detection of these effects, it is thought that it will be beneficial to reduce and eliminate these effects and to focus on experimental studies that will improve the mental health of individuals and enable them to be mentally healthier.

Happiness can be defined as feeling well physically and mentally. Trying to define happiness psychophysiological, it could be said that releasing necessary hormones at the right amount and right time (Canan, 2019; Karaismailoglu, 2022). Being happy is also related to the communication between the heart and brain. There is constant communication between the heart and the brain, and good communication means that the autonomic nervous system is physiologically in balance (store.HeartMath.com; Besler, 2020). This situation is defined as coherence. In other words, coherence means the harmony of heart and mind. The lack of harmony between the heart and the mind can lead to situations such as not feeling well mentally and low morale and motivation (Nuuttila et al., 2017; Ekmekci, 2022). Whether the heart and mind are in harmony or not it can be calculated through the heart rate variability. Nowadays it can be easily measured with biofeedback devices. These biofeedback devices can be easily worn since wearable technology devices have improved rapidly.

There are many methods and techniques to feel happy. Breathing exercises are among the most effective methods to provide heart and mind coherence and feel better (Sutarto et al., 2010; Steffen et al., 2021). During these breathing exercises using the diaphragm is an effective way of doing the breathing exercise and being in coherent (Nakayama et al., 2015; Ekmekci, 2022).

The development of wearable technology has made it possible to measure how breathing affects coherence. There are many devices to measure coherence they all work differently however all devices give some quantitative data that can be interpreted and analyzed (Thapliyal et al., 2017). HeartMath Inner Balance is one of these devices which can be conveniently worn and make measurements about how coherent the individual is. The small black part (clic) attached to the left ear and ellipse-shaped with a heart picture on is replaced near the heart. The device connects to smartphones or tablets via Bluetooth and starts giving biofeedback (Thapliyal et al., 2017; store.HeartMath.com).



(<https://store.HeartMath.com/innerbalance>)

Figure 1. HeartMath inner balance and Android application

According to the information above, measuring emotions is possible nowadays. Even though Covid-19 Pandemic have finished, the psychological effects are proceeding. Thus, studies about downshifting the psychological effects of pandemics are very important for a better and happy world. Considering this information, the problem of this study is the negative psychological effects of the pandemic on university students. According to this problem, the purpose of this study is to determine the happiness and coherence levels of university students and experiment with the effect of HRV training on coherence and happiness.

## 2. Method

In this study, pretest-posttest with the control group was preferred which is one of the quantitative research methods. Oxford Happiness Inventory and Inner Balance HeartMath were used as data collection tools. Inner Balance Bluetooth uses BT4.0 (BLE-Bluetooth Low Energy) which works at an output power range of 0.5 milliwatts (mW) or less—this is significantly lower than mobile phones which typically have output levels between 250 mW and 2000 mW. The tiny Bluetooth emitter is in the module that attaches to your garment, not in the ear sensor. Inner Balance Bluetooth is compliant with applicable FCC tests (Thapliyal et al., 2017; Besler, 2020; HeartMath.com). The Inner Balance™ app receives the information from the Inner Balance pulse sensor and translates it into real-time feedback on your Heart Rate Variability (HRV). In the App, you can also track the results, and practice guided Techniques and Exercises. It is an innovative approach to improving wellness through training, education, and self-monitoring. The app helps you track your progress in the journey of learning how to manage stress, change your moods, and create a more positive outlook.



(<https://www.diygenius.com/meditation-and-heart-rate-variability-training>)

Figure 2. Inner balance HeartMath application

Another data collection tool is Oxford Happiness Inventory which is 6 Likert scale. This Inventory has 29 questions, and the total score shows the level of happiness after reverse coding questions 6, 10, 13, 14, 19, 23, 24, 27, 28, 29.

### 2.1 Research Group

A purposive voluntary sampling method was preferred to choose the research group. Sports management students were chosen after the Covid-19 pandemic. All students are from the same class. The study was done during the 2021-2022 academic year. 20 students volunteered to take part in this study experiment group (N = 10) and the control group (N = 10). The research group consists of (N = 6) Women and (N = 14) Men. Also, the age of the research group is (M = 21.80). The experiment and control groups were randomly selected.

### 2.3 Data Collection

Data collection was done in Pamukkale University Psychophysiology laboratory. Oxford Happiness Inventory and Inner Balance Heart Math were used during the pretest and posttest. The data was collected during the 2021-2022 academic year.

### 2.4 Experiment Process

The pretest was done to experiment, (N = 10) and control group (N = 10) data was collected with the Inner Balance Heart Math and Oxford Happiness Inventory. After the pretest 8 Weeks of HRV training protocol was applied to the experiment group. For 8 weeks, only the

experimental group (N = 10) was asked to do 4 × 4 breathing exercises before going to sleep for 10 minutes, inhaling through the nose to the diaphragm in 4 seconds and exhaling through the mouth in 4 seconds. Also, they were asked to hug themselves and say, “I am happy, and I love myself” A special WhatsApp group was established for the experimental group and a video about how to do the breathing exercise was shared. In addition, the coordination of the experimental group was done through this WhatsApp group, and they were all asked to report every day after finishing the breathing exercises. Apart from the breathing exercise, there were not any other requests from the experimental group and the participants continued their normal routine lives.

### 2.5 Data Analyzes

After collecting data with Oxford Happiness Inventory and Inner Balance Hearth Math, normality tests and t-tests were done with SPSS 20. Packet program.

### 3. Results

According to the results of the study, there have been significant differences between pretest and posttest  $P < 0.05$ . The experiment group’s pretest results for happiness were 4.2172 while the control group’s was 4.0414. In addition, the pretest for coherence levels for the experiment group was 0.81 while the control group was 1.08. After 8 weeks of HRV training, the level of happiness of the experiment group increased to 4.70 while the control group’s decreased to 4.0143. The post-test results for coherence levels have also changed, the experiment group’s coherence levels increased to 2.89, and the control group’s coherence levels decreased to 0.83.

Table 1. Pretest, posttest and t-test results of happiness and coherence levels

Scale and biofeedback	Groups	N	X±SD	t	p
Pretest happiness	Experimental	10	4.2172±.67260	.746	.465
Pretest happiness	Control	10	4.0414±.32174		.469
Posttest happiness	Experimental	10	4.70±.62954	2.606	.018*
Posttest happiness	Control	10	4.0143±.54430		.018*
Pretest coherence	Experimental	10	0.810±.44083	-1.125	.275
Pretest coherence	Control	10	1.080±.61788		.277
Posttest coherence	Experimental	10	2.89±1.08878	5.635	.000*
Posttest coherence	Control	10	0.83±.38887		.000*

#### 4. Discussion

The results have shown that HRV training breathing exercises before sleeping help individuals feel better. The happiness levels of the experiment group have risen while the control group's decreased. At the same time, the Coherence levels of the experiment group have increased in contrary control groups coherence levels have decreased. In other words, the experiment group's autonomic nerve system works better than before thus they feel better physically and emotionally. These results are very important because it shows that just doing the right breathing techniques before sleeping can make someone feel better. These students were not asked to do anything extra they continued their daily routines.

It's a fact that of COVID-19 pandemic had curtailed effects on the mental well-being of individuals (Alradhawi et al., 2020). However, these negative effects of the pandemic could be solved in natural ways. As Canan (2019) mentioned in his book if humans could turn back to their factory defaults, being happy is not a hard thing to achieve. Life is becoming more digital and living in the digital world makes it hard to feel better physically and emotionally.

Studies about promoting happiness are widespread. There are many ways to promote happiness of individuals. For example, caring for others, spending money for pets or other people promotes happiness (White et al., 2022). Another study claims that rather than oneself, happiness comes from trying to make others feel good (Titova & Sheldon, 2022). However, we may not have the chance to help or care for others all the time. Thus, an individual should know the ways of being happy when they are alone. In other words, to promote happiness a person should know techniques to be balanced emotionally. Academic literature about HRV shows that there is a positive relationship between happiness and HRV. In simple words the better HRV you have the better you feel (Shi et al., 2017). These results are similar to our study. Our results have shown that sports management students who are in the experiment group have increased their happiness in parallel with their HRV. In other words, the experiment group is more coherent and happier after 8 weeks of HRV training. Also, in this study wearable biofeedback was used which is a new approach in scientific studies (Sutarto et al., 2010). Especially recent studies have increased on HRV, and they are many findings about HRV analysis playing an important role in emotional study and detection (Kop et al., 2011; Rakshit et al., 2016; Zhu et al., 2019; Liu et al., 2020). As a result, it has become a tool for advancing technological possibilities to further the limits of human beings. However, many training tools are being developed to improve the physical fitness characteristics of athletes. In our research, we used dynamic and static core exercises that are used today. We observed that dynamic and static core exercises for 8 weeks can better improve balance performance in football players aged 10-12 (Erol, 2022).

In conclusion, to feel better HRV training can be practical and useful. As it has been seen in the results of the study just by doing the right breathing technique. It is possible to change our emotional state in long term.

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## References

- Akat, M., & Karatas, K. (2020). Psychological effects of COVID-19 pandemic on society and its reflections on education. *Electronic Turkish Studies*, 15(4), 1-13. <https://doi.org/10.7827/TurkishStudies.44336>
- Alradhawi, M., Shubber, N., Sheppard, J., & Ali, Y. (2020). Effects of the COVID-19 pandemic on mental well-being amongst individuals in society—A letter to the editor on “The socio-economic implications of the coronavirus and COVID-19 pandemic: A review”. *International Journal of Surgery*, 78, 147. <https://doi.org/10.1016/j.ijisu.2020.04.070>
- Besler, H. K. (2020). *The Effect of Mental Training on Mental Stamina and Problem Solving Skills of Football Coaches (PhD Thesis)*. Retrieved from <https://tez.yok.gov.tr/> National Thesis Center. 647963
- Canan, S. (2019). *Man's Factory Settings, Book 1*. Istanbul: Tutikitap.
- Cetin, C., & Ozlem, A. N. U. K. (2020). Loneliness and resilience during the COVID-19 pandemic: A sample of public university students. *Eurasian Journal of Social and Economic Studies*, 7(5), 170-189.
- Ceviz, N., Tektas, N., Basmaci, G., & Tektas, M. (2020). Analysis of the variables affecting the anxiety levels of university students during the Covid 19 pandemic process. *International Journal of Scholars in Education*, 3(2), 312-329.
- Ekmekci, R. (2022). *Mental Training in Sports (3b)*. Ankara: Detay Yayıncılık.
- Erol, S. (2022). An investigation of the effects of static and dynamic core exercises applied to football players aged 10-12 years on some physical fitness characteristics. *International Journal of Curriculum and Instruction*, 14(3), 2132-2140. <https://doi.org/10.17363/SSTB.2022/ABCD89/43.2>
- Karaismailoglu, S. (2022). *The Female Brain The Male Brain*. Elma Yayınevi.
- Kop, W. J., Synowski, S. J., Newell, M. E., Schmidt, L. A., Waldstein, S. R., & Fox, N. A. (2011). Autonomic nervous system reactivity to positive and negative mood induction: The role of acute psychological responses and frontal electrocortical activity. *Biological Psychology*, 86(3), 230-238. <https://doi.org/10.1016/j.biopsycho.2010.12.003>
- Liu, I., Ni, S., & Peng, K. (2020). Happiness at your fingertips: Assessing mental health with smartphone photoplethysmogram-based heart rate variability analysis. *Telemedicine and e-Health*, 26(12), 1483-1491. <https://doi.org/10.1089/tmj.2019.0283>
- Nakayama, I., Koga, K., & Kobayashi, J. (2015). Abdominal breathing restrictor for mental

tension enhancement. *Artificial Life and Robotics*, 20(2), 124-128. <https://doi.org/10.1007/s10015-015-0205-1>

Nuutila, O. P., Nikander, A., Polomoshnov, D., Laukkanen, J. A., & Häkkinen, K. (2017). Effects of HRV-guided vs. predetermined block training on performance, HRV and serum hormones. *International Journal of Sports Medicine*, 38(12), 909-920. <https://doi.org/10.1055/s-0043-115122>

Rakshit, R., Reddy, V. R., & Deshpande, P. (2016). Emotion detection and recognition using HRV features derived from photoplethysmogram signals. *Proceedings of the 2nd workshop on Emotion Representations and Modelling for Companion Systems* (pp. 1-6). <https://doi.org/10.1145/3009960.3009962>

Shi, H., Yang, L., Zhao, L., Su, Z., Mao, X., Zhang, L., & Liu, C. (2017). Differences of heart rate variability between happiness and sadness emotion states: A pilot study. *Journal of Medical and Biological Engineering*, 37(4), 527-539. <https://doi.org/10.1007/s40846-017-0238-0>

Steffen, P. R., Bartlett, D., Channell, R. M., Jackman, K., Cressman, M., Bills, J., & Pescatello, M. (2021). Integrating Breathing Techniques into Psychotherapy to Improve HRV: Which Approach Is Best? *Frontiers in Psychology*, 12, 191. <https://doi.org/10.3389/fpsyg.2021.624254>

Sutarto, A. P., Wahab, M. N. A., & Zin, N. M. (2010). Heart Rate Variability (HRV) biofeedback: A new training approach for operator's performance enhancement. *Journal of Industrial Engineering and Management*, 3(1), 176-198. <https://doi.org/10.3926/jiem.2010.v3n1.p176-198>

Thapliyal, H., Khalus, V., & Labrado, C. (2017). Stress detection and management: A survey of wearable smart health devices. *IEEE Consumer Electronics Magazine*, 6(4), 64-69. <https://doi.org/10.1109/MCE.2017.2715578>

Titova, L., & Sheldon, K. M. (2022). Happiness comes from trying to make others feel good, rather than oneself. *The Journal of Positive Psychology*, 17(3), 341-355. <https://doi.org/10.1080/17439760.2021.1897867>

White, M. W., Khan, N., Deren, J. S., Sim, J. J., & Majka, E. A. (2022). Give a dog a bone: Spending money on pets promotes happiness. *The Journal of Positive Psychology*, 17(4), 589-595. <https://doi.org/10.1080/17439760.2021.1897871>

Zhu, J., Ji, L., & Liu, C. (2019). Heart rate variability monitoring for emotion and disorders of emotion. *Physiological Measurement*, 40(6), 064004. <https://doi.org/10.1088/1361-6579/ab1887>



Appendix A

**Pamukkale University social and human sciences scientific research and publication  
ethics committee decision**

Evrak Tarih ve Sayısı: 08.04.2022-E.193680

T.C.  
PAMUKKALE ÜNİVERSİTESİ  
SOSYAL VE BEŞERİ BİLİMLERİ BİLİMSEL ARAŞTIRMA VE YAYIN ETİĞİ KURULU

SAYI: 68282350/2022/G08

Toplantı Tarihi : 06.04.2022  
Toplantı Sayısı : 8  
Toplantı Saati : 15:00

10.125.1.145  
7205  
12.04.2022

**KARAR 13-** Üniversitemiz Spor Bilimleri fakültesi Spor Yöneticiliği Bölümü Öğretim Elemanı Arş. Gör. Dr. Hamza Kaya BEŞLER' in, "*Kalp Atım Hızı Değişkeni Antrenmanı Bizleri Mutlu Edebilir Mi?*" başlıklı çalışmasına yönelik başvuru formu ile usul ve etik açıdan verdiği beyan ve ekler tetkik edilmiş olup; proje sahibinin, başvurusunda yer alan bilgi, belge ve taahhütnamelere uygun bilimsel davranışlar sergileyeceği kanaati oluşmuştur. İş bu karar oy birliği ile alınmıştır.

ASLI GİBİDİR  
06.04.2022  
  
Prof. Dr. Ertuğrul İŞLER  
Başkan

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