Pertanika J. Sci. & Technol. 26 (3): 1539 - 1546 (2018)

PERTANIKA JOURNALS

SCIENCE & TECHNOLOGY

Journal homepage: http://www.pertanika.upm.edu.my/

Short Communication

The Effectiveness of the Quick Coherence Technique using Heart Rate Variability-Biofeedback Technology on the Recovery of Heart Coherence among University Students

Abdul Qahar Sarwari[1,2]* and Mohammad Nubli Wahab[1]

[1]*Center for Modern Languages and Human Sciences, University Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia*
[2]*Faculty of Journalism, Alberuni University of Afghanistan, Afghanistan*

ABSTRACT

Literature has established the effectiveness of self-regulatory techniques using Heart Rate Variability (HRV)-Biofeedback Technology in improving individual's heart coherence. The current study aims to evaluate the effectiveness of Quick Coherence Technique, a self-regulatory technique, through the application of HRV-biofeedback technology on the level of heart coherence among university students. A total of 20 students of a technical public university participated in the study. The Quick Coherence Technique (QCT) and the emWave device and software of the HeartMath Institute were used to collect the data. According to the HRV power spectrum, the HRV data is divided under very low frequency (VLF), low frequency (LF), and high frequency (HF) frequency ranges. Based on the results, the use of HRV-biofeedback technology and the QCT had helped to increase the levels of HRV scores and heart coherence of the participants.

Keywords: Biofeedback, coherent heart, heart coherence, Heart Rate Variability, Quick Coherence Technique

ARTICLE INFO

Article history:
Received: 03 May 2017
Accepted: 03 April 2018

E-mail addresses:
qaharesarwari@gmail.com (Abdul Qahar Sarwari)
nubli@ump.edu.my (Mohammad Nubli Wahab)
*Corresponding Author

ISSN: 0128-7680

INTRODUCTION

The coherent heart may help individuals to have more successful personal and social lives in their societies. According to the HeartMath.org (2016), coherence refers to the "clarity of thought, speech and emotional composure". The heart rate variability (HRV) and the HRV-biofeedback technology which were developed by the HeartMath Institute and are available in the portable devices and software (Ross, 2011), help researchers to assess the levels of HRV and heart coherence of individuals. The HRV has quite a long history, but the recent developments through the durable efforts of scholars and researchers had more effects on HRV-related issues and studies. According to McCraty and Shaffer (2015), there are some evidences from the assessment of multifaceted rhythms of heart known as heart rate variability (HRV) from 1960s and 1970s, it has gained serious attention recently.

The heart rate variability which indicates the time interval changes between the adjoining heartbeats is an embryonic property of mutually-dependent regulatory mechanisms that works on diverse dimensions of time to become accustomed to psychological and environmental challenges (McCraty & Shaffer, 2015; Porges, 2007; Task Force, 1996). According to them, a good range of HRV frequency is associated with the well-performance, intrinsic and natural self-regulatory capacity, and adaptability and flexibility of an individual. They also argued that the heart coherence is measurable through HRV and HRV analyses. The heart coherence is measured through the identification of the higher peak of 0.04 HZ to 0.26 HZ frequency range under the HRV power spectrum. Moreover, coherence involves association, correlations, steadiness and efficient energy use. For instance, the individuals' speeches or opinions can be considered coherent if the ideas and words fitted together and will be considered incoherent if the words and ideas are unconnected and meaningless. The physic and physiology fields also use coherence term to describe the situation of harmonisation between different erratic mechanisms (McCraty & Shaffer, 2015; Sutarto, Nubli & Zin, 2012; Porges, 2007).

Scholars (e.g. McCraty & Shaffer, 2015; Porges, 2007; Ross, 2011; Jacob, 2010) have focused on the effectiveness of the use of self-regulatory techniques on the improvement of the human physical and psychological well-being. As pointed out, the techniques of self-regulation have shown positive impacts on the production of physical and psychological well-being among members of different groups. The HRV and self-regulatory techniques are effective in improving human performance and decrease of anxiety among individuals, especially among university students in a multicultural university environment (Lagos et al., 2008; Thurber, 2006). Moreover, according to McCraty and Zayas (2014), self-regulation includes the skills to manage impulses and control one's own behaviours through awareness of one's emotions and thoughts at the same time. McCraty and Shaffer (2015) on a study on new perspectives of physiological mechanisms and assessment of self-regulatory capacity argued that, a favourable level of HRV reflects well social performance and healthy function, a natural self-regulatory capability, and flexibility. At the same time, higher HRV frequency range of above from 0.04 of LF and below the 0.26 score of HF, which is favourable frequency, indicates a good psychophysiological situation which is friendly and well-matched with social connections and public communication (Bernston, Cacioppo, & Quigley, 1997; Quintana et al., 2012; Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology, 1996).

However, the scholars conducted their studies in the Western parts of the world. There are many differences between the Western and Eastern environments and norms of human performance (Abu Bakar & Mustaffa, 2013; Gudykunst, 2001). At the same time, there are no evidences in the literature to show that whether the cited arguments are helpful or not among university students in an Asian university environment. Thus, this study used the Quick

Coherence Technique through the application of HRV-biofeedback technology to evaluate its impacts on the levels of heart coherence of university students at a Malaysian university campus.

LITERATURE REVIEW

The heart coherence (the balanced level of HRV) l decreases psychological distresses, problematic behaviours and concerns, and improves classroom behaviours, academic achievements and social performance among students (McCraty & Shaffer, 2015; Ross, 2011; Childre & Rozman, 2003). Moreover, heart coherence, psychological well-being, flexibility and well-performance skills are associated with the desirable HRV scores of individuals (McCraty & Shaffer, 2015; McCraty & Childe, 2010). The results of a study by McCraty and Shaffer (2015) confirm that a good rate of HRV reflects proper social performance among individuals. Based on results of a study on the role of vagal function in the risk for cardiovascular disease and mortality, Musselman, Evans and Nemeroff (1998) argued that, to guide well-organised portion of cognitive and awareness resources, HRV is helpful for competent performance in a demanding environment where a delayed reply and behavioural embarrassment are the key. However, low HRV increases the risk of stress disclosure (Thayer, 2007).

Furthermore, the heart actions and reactions of individuals are associated with their autonomic nervous system. The autonomic nervous system (ANS) which affects the human heart rhythmic actions has two parts: sympathetic nervous system (SNS) and parasympathetic nervous system (PNS). The levels of SNS were associated with the *fight-and-flight* situation and cognitive and psychological stress, and the high levels of activities of PNS are associated with too much relaxation and laziness (Jacob, 2010; McCraty & Childre, 2010; Bernston, Cacioppo, & Quigley, 1991). The HRV frequency bands are divided under three bands which are: very low frequency (VLF), low frequency (LF), and high frequency (HF). The VLF frequency and LF frequency of lower than 0.4 Hz are associated with the SNS, and the HF frequency of above 0.15 is associated with the PNS. The desirable and good HRV frequency range which is associated with coherent heart, good performance, and psychological flexibility is from 0.4 of LF to 0.26 of HF (Tanis, 2015; McCraty & Shaffer, 2015; Jacob, 2010; McCraty & Childre, 2010; Bernston et al., 1991).

Thayer (2007) argued that HRV is associated with executive and nonexecutive function tasks, and physical detraining also affects HRV. According to Ross (2011), the HRV-biofeedback technology tools help people to control their HRV and enter in the state of coherence, to have coherent heart and stable HRV. The heart rate variability (HRV) biofeedback as the promising mechanism for the rising HRV has become more popular in the HRV setting of studies (Rene, 2008; Pignotti & Steinberg, 2001). Rene (2008) also argued that the findings of a study on the effectiveness of a handy biofeedback tool regarding mental problems have confirmed that the HRV-biofeedback is a safe and non-invasive device.

Researchers and scholars (e.g. McCraty & Shaffer, 2015; Reyes, 2014; Ross, 2011; Porges, 1997) have used the HRV-biofeedback technologies, including emWave device and software, in their studies on different fields, such as health, psychology, education, sports, and military. The results from their studies confirmed the effectiveness of the use of emWave, the QCT and other biofeedback technologies and techniques on human performance and enable individuals to assess the actions and reactions of their hearts. However, to see whether the above-mentioned techniques and technologies are useful in an Asian collegiate environment, this study assess the effectiveness of the quick coherence technique using heart rate variability-biofeedback technology on the recovery of heart coherence among university students at a Malaysian public university.

STUDY DESIGN

The Quick Coherence Technique (QCT) of the HeartMath.org (2016) was used to assess its relationship with the probable developments in the levels of heart coherence of the participants. The QCT includes three stages: heart focus, heart breathing, and heart feeling (HeartMath.org, 2016; Ross, 2011; Childre, Martin, & Childoe, 2000). During the data collection process, the heart focus stage asks the participants to focus on the area of their hearts. The heart breathing stage asks the participants to breathe slowly and deeply and imagine the process of their breathing. Finally, the heart feeling stage asks the participants to try to remember a good moment of their lives and try to re-experience that moment (HeartMath.org, 2016; Ross, 2011; Childre, Martin, & Childoe, 2000).

PARTICIPANTS

The participants of this study were 20 undergraduate students of a Malaysian technical public university, namely University Malaysia Pahang. The participants were between 18 and 22 of age and they voluntarily participated in the study.

INSTRUMENTS

The emWave tool and the emWave PC biofeedback (1.0) software which is developed by the HearthMath Institute for the heart rhythm variations were used. According to Reyes (2014), the emWave is a portable device that helps individuals to monitor HRV, and to rehearse biofeedback techniques. The HeartMaath Institute through conducting of various studies has provided evidences for the effective role of hearts of individuals on their wellbeing and balanced lives. The emWave tool and other biofeedback technologies of HeartMath Institute are valid based on various academic studies on biofeedback, stress and emotions for around 17 years (HeartMath.org, 2016). During the data collection sessions, the emWave PC tool, which is a portable device, was connected into a computer to access its energy from the computer. Based on the HRV data collection procedure, the device's sensor will be placed on the ears. Figure 1 shows the emWave PC tool and its ear sensor. The pictures were taken from the HeartMath.org (2016).

Figure 1. The emWave PC tool and its ear sensor

DATA COLLECTION PROCEDURE

Before the data collection sessions, the letter of consent which included information about the application of HRV-technology and techniques, data collection procedure, time and sessions was given to the participants . The data were collected individually from the participants, and they were allowed to look on the screen in the end of each data collection session. The data collection had four sessions, which were the simple baseline session without intervention of any technique, and the three stages of the QCT, which are: heart focus, heart breathing, and heart feeling, and the exact time for each session was two minutes.

DATA ANALYSIS

The data were analysed based on the HRV power spectrum. According to the HRV power spectrum, generally there are three types of HRV frequencies which affect the autonomic nervous system through either the sympathetic or parasympathetic nervous system. The frequency types are: very low frequency (VLF), low frequency (LF) and high frequency (HF). The VLF frequency is below the 0.05 HZ scoring band, the LF frequency is from 0.05 up to 0.15 HZ, and the HF is the range of 0.15 – 0.4 HZ (Jacob, 2010; McCraty & Childre, 2010; Bernston et al., 1991).

Based on the HRV power spectrum, a good HRV score is above 0.04 HZ of VLF to below 0.26 HZ of HF. The VLF band and the LF band of below 0.04 HZ belongs to the sympathetic nervous system and too low and not good, and also above the 0.26 HZ of HF belongs to the parasympathetic nervous system and too high and it is also not good (McCraty & Shaffer, 2015; Appelhans & Lueccken, 2006). The emWave PC biofeedback (1.0) software and device used for the purpose of this study, show scores for the frequency ranges are from 0 to 100 instead of 0 to 1, and in this scoring system, 0.15 means 15 and 0.4 means 40 (HeartMath.org 2016).

FINDINGS

The findings from this study showed that there were some positive changes in the levels of heart coherence of the participants from the baseline session to the three other data collection stages which were conducted under the Quick Coherence Technique (QCT). Based on the coherence ratio scoring results, in the baseline session which was conducted without the intervention of any self-regulatory technique (any stages of CQT), most of the participants had higher scores for the very low frequency (VLF) band which indicates the incoherent heart. But, through the application of three stages of the QCT, the low frequency (LF) scores of the participants increased significantly connected to the coherent heart.

Based on the coherence ratio scoring, the mean score of all 20 participants for the low frequency (LF) band of the baseline session was 18.6. But, their mean score for the heart focus was 24.6, for the heart breathing session was 37.3, and for the heart feeling session it was 35.9. The results showed the positive effects of the use of the QCT on the increase of heart coherence among university students. Table 1 shows the coherence ratio mean scores of all participants for the four sessions of HRV data.

Table 1
Illustrates the mean scores of HRV data collections sessions

Data Collection Sessions	Scores for each Session		
	VLF	LF	HF
Baseline	70.2	18.6	11.1
Heart Focus	60.3	24.6	15
Heart Breathing	51.9	37.3	10.6
Heart Feeling	47.2	35.9	16.8

DISCUSSION AND CONCLUSION

This study was carried out to evaluate the effectiveness of the use of the Quick Coherence Technique (QCT), as a self-regulatory technique, on the improvement of heart coherence of university students through the application of the heart rate variability (HRV) - biofeedback technology. The levels of heart coherence of the participants were assessed through four different stages, including the baseline. The data collection stages were the baseline session in which the data were collected without involvement of any self-regulatory technique, and the three other stages with the intervention of the QCT.

During the baseline session, the participants were mostly in *fight-and-flight* situation with their higher scores of very low frequency (VLF) band; because their HRV scores were in vibration and could not relax well. Based on the related work (e.g. McCraty & Shaffer, 2015; Jacob; 2010; Bernston et al., 1991), higher scores in VLF belong to the sympathetic nervous system (SNS) that associated with fight-and-flight situation and psychological stress. However, during the QCT stages, their heart coherence improved and their scores for the low frequency (LF) band which indicates the coherence situation increased significantly. As the low frequency (LF) scores significantly changed from baseline which was 18.6 to 24.6 for the Heart Focus session of the QCT, 37.3 for the Heart Breathing session, and 35.9 for the Heart Feeling session, and based on McCraty and Shaffer (2015) higher LF scores associated with flexibility, psychological well-being and good performance; thus, the results support the effectiveness of the use of the self-regulatory techniques, especially the QCT, on the improvement of psychological well-being.

The results from this study support McCraty and Shaffer (2015), Porges (2007), and McCraty and Zayas (2014) regarding the effectiveness of the use of HRV-technology and self-regulatory techniques on the increase of heart coherence of individuals. Based on the results from this study, the use of QCT had positive effects on the increase of low frequency (LF) scores and heart coherence of the participants. Moreover, the application of the HRV-biofeedback technology and self-regulatory techniques, including the QCT, would help university students to improve the levels of their heart coherence.

The main contribution of this study is to show the effectiveness of CQT self-regulatory technique and Heart Rate Variability (HRV)-Biofeedback Technology in the improvement of heart coherence among university students from different backgrounds in an Asian university environment. However, as this study had a small number of participants and also used self-regulatory techniques, thus a wider sample would be useful and through the application of different self-regulatory techniques for better validity of the outcome.

ACKNOWLEDGEMENTS

This study was conducted by the sponsorship of University Malaysia Pahang (UMP).

REFERENCES

Bakar, H. A., & Mustaffa, C. S. (2013). Organizational communication in Malaysia organizations. *Corporate Communications: An International Journal, 18*(1), 87-109.

Berntson, G. G., Cacioppo, J. T., & Quigley, K. S. (1991). Autonomic Determinism: The modes of Autonomic Control, the Doctrine of Autonomic Space, and the Laws of Autonomic Constraint. *Psychological Review, 98*(4), 459-487.

Childre, D., & Rozman, D. (2003). *Transforming anger: The Heartmath solution for letting go of rage, frustration, and irritation.* Oakland: New Harbinger Publications.

Childre, D., Martin, H., & Childoe, D. (2000). *HeartMath solution: The Institute of HeartMath's revolutionary program for engaging the power of the heart's intelligence.* San Francisco: HarperOne.

Gudykunst, W. B. (2001). *Asian American ethnicity and communication.* Thousand Oaks, CA: Sage.

HeartMath.org. (2016). *Quick coherence technique.* Retrieved from http://cdn.quantumintech.com/emwave-pro-library/asmts-hrv.html.

Jacob, K.K. (2010). *Separating attention from arousal during TV viewing: using heart rate variability to track variations in sympathetic and parasympathetic activation* (Ph.D. Thesis). Indiana University Press, USA.

Lagos, L., Aschillo, E., Vaschill, B., Lehrer, P., Bates, M., & Pandina, R. (2008). Heart rate variability biofeedback for dealing with competitive anxiety: A case study. *Applied Psychophysiology and Biofeedback, 36*(3), 109–115.

McCraty, R., & Childre, D. (2010). Coherence: bridging personal, social, and global health. *Alternative Therapies in Health and Medicine, 1*6(4), 10-24.

McCraty, R., & Shaffer, F. (2015). Heart rate variability: new perspectives on physiological mechanisms, assessment of self-regulatory capacity, and health risk. *Global Advances in Health and Medicine, 4*(1), 46-61.

McCraty, R., & Zayas, M. (2014). Cardiac coherence, self-regulation, autonomic stability, and psychosocial well-being. *Frontiers in Psychology, 5*, 1-13.

Musselman, D. L., Evans, D. L., & Nemeroff, C. B. (1998). The relationship of depression to cardiovascular disease: epidemiology, biology, and treatment. *Archives of General Psychiatry, 55*(1), 580-592.

Pignotti, M., & Steinbegr, M. (2001). Heart rate variability as an outcome measure for thought field therapy in clinical practice. *Journal of Clinical Psychology, 57*(10), 1193-1206.

Porges, S. W. (1997). Emotion: An evolutionary by product of the neural regulation of the autonomic nervous system. In C. S. Carter, B. Kirkpatrick & I. I. Lederhendler (Eds.), *Annals of the New York Academy of Sciences: Vol. 807. The integrative neurobiology of affiliation* (pp. 62–77). New York: New York Academy of Sciences.

Porges, S. W. (2007). The polyvagal perspective. *Biological Psychology, 74*(2), 116-43.

Quintana, D. S., Guastella, A. J., Outhred, T., Hickie, I. B., &Kemp, A. H. (2012). Heart rate variability is associated with emotion recognition: Direct evidence for a relationship between the autonomic nervous system and social cognition. *International Journal of Psychophysiology, 86*(2), 168–172.

Rene, R. (2008). *The efficacy of a portable HRV feedback device in conjunction with mental health treatment of clients with major depressive disorder enrolled in a county welfare-to-work program.* (Ph.D. Thesis). Alliant International University Press, USA.

Reyes, F. J. (2014). Implementing heart rate variability biofeedback groups for veterans with posttraumatic stress disorder. *Biofeedback, 42*(4), 137-142.

Ross, M. W. (2011). *The evolution of education: Use of biofeedback in developing heart intelligence in a high school setting.* (PhD. Thesis). University of Calgary Press, USA.

Sutarto, A. P., Nubli A. W., & Zin, N. M. (2012). Resonant breathing biofeedback training for stress reduction among. *International Journal of Occupational Safety and Ergonomics, 18*(4), 549–561.

Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology. (1996). Heart rate variability. Standards of measurement, physiological interpretation, and clinical use. *European Heart Journal, 17*(3), 354–381.

Thayer, J. F. (2007). What the heart says to the brain (and vice versa) and why we should listen. *Psychological Topics, 16*(2), 241-250.

Thurber, M. R. (2006). *Effects of heart-rate variability biofeedback training and emotional regulation on music performance anxiety in university students.* (Ph.D. Thesis). University Of North Texas Press, USA.