

PSYCHOLOGICAL EFFECTS OF THE
RECITATION OF THE QURAN AMONG
UNIVERSITY STUDENTS THROUGH THE
INVESTIGATION OF HEART RATE
VARIABILITY AND BREATHING BEHAVIOUR

EMAN GHANIM NAYEF

DOCTOR OF PHILOSOPHY

UNIVERSITI MALAYSIA PAHANG



SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Doctor of Philosophy.

(Supervisor's Signature)

Full Name :

Position :

Date :



STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

(Student's Signature)

Full Name : EMAN GHANIM NAYEF

ID Number : A10833695

Date : February 2019

PSYCHOLOGICAL EFFECTS OF THE RECITATION OF THE QURAN AMONG
UNIVERSITY STUDENTS THROUGH THE INVESTIGATION OF HEART RATE
VARIABILITY AND BREATHING BEHAVIOUR

EMAN GHANIM NAYEF

Thesis submitted in fulfillment of the requirements
for the award of the degree of
Doctor of Philosophy

Centre For Modern Languages & Human Sciences
UNIVERSITI MALAYSIA PAHANG

FEBRUARY 2019

ACKNOWLEDGEMENTS

“All praises and thanks to ALLAH”

Completing a PhD study is a very time consuming endeavor. I would not have been able to complete this research work without the assistance of the following people:

First and foremost, I would like to express my gratitude to my supervisor Associate Professor MOHAMMAD NUBLI ABDUL WAHAB for his encouragement, assistance, understanding and guidance throughout the period of my research. I would like to extend my gratitude to all members of staff of Centre for Modern Language and Human Science (CMLHS), and PIMPIN centre at University Malaysia Pahang, I would like to express my respect, honour and warmest thanks to my husband and my family for their support and help.

ABSTRAK

Al-Quran adalah firman Allah yang diturunkan kepada Nabi Muhammad dan pembacaan Al-Quran adalah sangat terkenal di kalangan masyarakat Islam dalam ibadat dan doa mereka. Salah satu kesan penting dari Quran kepada pembelajaran pelajar pencapaian mereka tercermin dalam emosi. Emosi mengawal tumpuan pelajar, dan mempengaruhi pembelajaran sendiri mereka. Tambahan pula, emosi adalah sebahagian daripada identiti pelajar, dan ia mempengaruhi perkembangan personaliti, kesihatan psikologi dan kesihatan fizikal. Kajian ini melibatkan menganalisa kesan psikologi semasa membaca Al-Quran untuk pelajar-pelajar sarjana muda. Objektif kajian ini adalah untuk mengkaji kesan bacaan Al-Quran pada variasi kadar denyutan jantung (HRV) dan Tingkah laku pernafasan (BB) di kalangan pelajar universiti, dan juga hubungan antara HRV / BB dengan pelbagai jenis bacaan Al-Quran, juga untuk mengetahui hubungan ayat-ayat yang berlainan dan gaya pembacaan Quran di kalangan pelajar. Reka bentuk kajian kuasi eksperimen kuasi berulang telah dijalankan dalam kajian ini. Bagi ujian HRV, tiga puluh pelajar siswazah sarjana muda yang mengambil bahagian dalam ujian ini dibahagikan kepada dua kumpulan; kumpulan pembaca al-Quran yang baik dan kumpulan pembaca al-Quran yang lemah. Parameter kebolehubahan kadar denyutan jantung (HRV) dan untuk ujian pernafasan, kesemua enam pelajar sarjana muda semua adalah baik yang terlibat dalam ujian ini, parameter kitaran pernafasan BB (B/min) diukur untuk memeriksa. Ujian pra-pos menunjukkan perbezaan yang signifikan dalam HRV, apabila nilai-p <0.05 untuk kedua-dua kumpulan. Dan keputusan antara kumpulan pembaca yang baik dan kumpulan pembaca yang lemah juga menunjukkan perbezaan yang jelas dalam data HRV apabila semua nilai-p <0.05. Pembaca yang baik mengawal. Hasil pengujian tingkahlaku pernafasan berdasarkan ujian Pra-Post menggambarkan bahawa nilai p <0.05 menunjukkan perbezaan yang ketara antara. Berdasarkan penemuan dari penyelidikan ini, pelajar yang baik dalam pembacaan Al-Quran, mereka mempunyai skor yang lebih tinggi dalam variasi kadar denyutan jantung dan skor HRV. Juga, membaca Al-Quran dengan peraturan Tajweed khususnya Maad dengan pernafasan yang panjang, dan Waqf dengan berhenti bernafas, yang menunjukkan keadaan yang. Berdasarkan hasil HRV dan BB melalui bacaan Al-Quran dari pelajar, hasil menunjukkan skor HRV yang tinggi, dan kitaran pernafasan. Kajian ini menyimpulkan bahawa membaca Al-Quran dengan Tajweed mempunyai nilai yang lebih tinggi dalam HRV dan Tingkah laku pernafasan (BB) (peningkatan ketenangan).

ABSTRACT

The *Quran* is the word of *Allah* revealed to the Prophet *Muhammad* and *Quran* recitation is a highly recognised among the Muslim community in their worships and prayer. One of the important effects of the *Quran* on undergraduate student learning and their achievement is reflected in emotions. Emotions control the attention of students, influence their motivation to learn, modify their choice of learning strategies and affect their self-regulation of learning. Furthermore, emotions are part of student identity, and they affect personality development, psychological health and physical health. This study involves analysing the psychological effects during reciting *Quran* for the undergraduate students. The objectives of this research are to examine the effects of *Quran* recitation on the Heart Rate Variability (HRV) and Breathing Behaviour (BB) among undergraduate university students, furthermore, the relationship between HRV/BB with different types of *Quran* recitation, also to discover the relationship of different verses and reading styles of reciting *Quran* with relaxation among students. Repeated measures quasi experimental design was conducted in this study. For HRV test, thirty undergraduate students whom participated in this test were divided into two groups; good *Quran* reciters group and weak *Quran* reciters group. The parameters of heart rate variability (HRV) are coherence ratio and accumulate coherence score, were measured to examine the outcome. And for breathing behaviour test, six undergraduate students all are good *Quran* reciters whom involved in this test, the parameter of BB breathing cycle (B/min) were measured to examine the outcome. Pre–post test score mean differences comparison showed significant differences in HRV, when all p-values < 0.05 for both group. And the results between good reciters group and weak reciters group also shows a clear significant difference in HRV data when all p-values < 0.05. Good reciters have effects on better HRV performance as compared to weak reciters. The Breathing Behaviour testing outcome based on Pre-Post-test illustrate that the p value <0.05 which show significant differences between the baseline and reciting *Quran*. According to the finding of this research, students who are good in reciting *Quran*, they have higher scores in heart rate variability depending on their higher scores in coherence ratio and accumulate coherence score of HRV. Also, reciting *Quran* with *Tajweed* rules specially *Maad* with long breathing, and *Waqf* with stop breathing, tends to more control on deep and slow breathing which reflect on relaxation conditions. Based on the result of the HRV and Breathing Behaviour through reciting *Quran* for students, results indicate high scores of HRV, and breathing cycle per minute indicate a low B/min, which means that the heart and breath work efficiently together, the parasympathetic branch of the ANS is activated, creating the relaxation response. This research concluded that the students who are good in reciting *Quran*, they have higher scores in heart rate variability and the breathing cycle become slower during reciting *Quran*, which mean the breath become a peace breath, that makes the students calm and relax.

TABLE OF CONTENT

DECLARATION	
TITLE	
ACKNOWLEDGEMENTS	ii
ABSTRAK	iii
ABSTRACT	iv
TABLE OF CONTENT	v
LIST OF TABLES	x
LIST OF FIGURES	xi
LIST OF SYMBOLS	xiii
LIST OF ABBREVIATIONS	xiv
CHAPTER 1 INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statements	5
1.3 Objectives of the Research	8
1.4 Research Questions	8
1.5 Research Hypothesis	8
1.6 Research Scope and Limitation	9
1.7 Operational Terms	9
1.8 Thesis Organization	12
CHAPTER 2 LITERATURE REVIEW	13

2.1	Introduction	13
2.2	Quran Recitation	13
2.2.1	Listening to the Quran	15
2.2.2	Themes in <i>Quran</i>	17
2.2.3	Reciting the Quran	18
2.3	Student Emotions	20
2.4	Relaxation and the Quran	21
2.5	Quran Therapy	22
2.6	Relationship Between HRV and Quran Recitation	23
2.7	Heart Rate Variability (HRV)	26
2.7.1	Autonomic Nervous System and Heart Rate Variability	30
2.7.2	HRV and Respiratory Sinus Arrhythmia	35
2.8	Breathing Behaviour	36
2.8.1	Relationship between Breath Behaviour and Quran Recitation	41
2.9	Summary	43
CHAPTER 3 RESEARCH DESIGN AND METHODOLOGY		45
3.1	Introduction	45
3.2	Research Design	45
3.3	Procedures	50
3.3.1	HRV Data Collection Procedure	51
3.3.2	Breathing Behaviour Data Collection Procedures	64
3.4	Data Analysis	67
3.4.1	HRV Data Analysis	67
3.4.2	Breathing Behaviour Data Analysis	68
3.5	Target Population	70

3.6	Selection of Participants	71
3.7	Apparatus and Preparation	72
3.7.1	HRV-Biofeedback Instrument	72
3.7.2	Breathing Behaviour -Biofeedback Instrument	75
3.7.3	Survey	78
3.8	Reliability	81
3.9	Validity	82
3.10	Preliminary Study	83
3.10.1	HRV	83
3.10.2	Breathing Behaviour	90
3.11	Summary	91
CHAPTER 4 RESULTS		92
4.1	Introduction	92
4.2	Result from Survey Information	92
4.2.1	Result from Demographic Information	92
4.2.2	Result from DASS	95
4.3	Results of the Objectives of the Study	96
4.3.1	Objective 1: To Examine The Effects of Quran Recitation on The HRV Among University Students (Good and Weak Reciters).	96
4.3.2	Objective 2: To Examine the Effects of Quran Recitation on The Breathing Behaviour (BB) Among University Students (Good and weak Reciters).	107
4.3.3	Objective 3: To Analyse The Relationship Between HRV/BB With Quran Recitation.	110
4.3.4	Objective 4: To Discover The Relationship of Different Verses and Reading Styles (<i>Tajweed</i> , Story, Theme, and Understanding) of Quran Recitation With Relaxation Among Students.	113

4.4	T-test Results	117
4.5	Summary	118
CHAPTER 5 DISCUSSION, CONCLUSION AND FUTURE WORK		120
5.1	Introduction	120
5.2	Discussions on Objectives of the Study	120
5.2.1	Objective 1: To Examine The Effects of Quran Recitation on The HRV Among University Students (Good and Weak Reciters).	121
5.2.2	Objective 2: To Examine The Effects of Quran Recitation on The Breathing Behaviour (BB) Among University Students (Good and Weak Reciters).	122
5.2.3	Objective 3: To Analyse The Relationship Between HRV/BB With Quran Recitation.	125
5.2.4	Objective 4: To Discover The Relationship of Different Verses and Reading Styles (<i>Tajweed</i> , Story, Theme, and Understanding) of Quran Recitation With Relaxation Among Students.	127
5.3	Discussion on Hypothesis of the Study;	129
5.4	Final Conclusion	130
5.5	Suggestions for Future Work	130
5.6	Summary	131
REFERENCES		132
LIST OF PUBLISHED PAPERS		145
APPENDIX A		146
APPENDIX B		150
APPENDIX C		154
APPENDIX D		155
APPENDIX E		158

APPENDIX F	164
APPENDIX G	165
APPENDIX H	167
APPENDIX I	174
APPENDIX J	179
APPENDIX K	183

LIST OF TABLES

Table 3.1	Regulations followed in selecting good and weak Quran readers	71
Table 3.2	The participants' information	79
Table 3.3	Depression Anxiety and Stress Scales.	80
Table 3.4	Results of session 1 (Tajweed).	85
Table 3.5	Results of session 2 (Surah).	87
Table 3.6	Results of session 3 (Theme).	89
Table 3.7	Results of session 4.	90
Table 3.8	Results of breathing behaviour	91
Table 4.1	Who and place the reciter learns Quran	93
Table 4.2	The result for the good (GR) and the weak (WR) Quran reciters with HRV scores.	95
Table 4.3	DASS results.	96
Table 4.4	The HRV data for the first session (Tajweed).	99
Table 4.5	HRV data for the second session (story).	101
Table 4.6	HRV data for the third session (theme)	103
Table 4.7	The HRV data for the fourth session (understanding).	105
Table 4.8	Result for effects of Tajweed on BB	109
Table 4.9	Relationship between CR and B/min	111
Table 4.10	The results of HRV and BB.	111
Table 4.11	The HRV data for all four sessions of reciting Quran.	116
Table 4.12	Data for reciting Quran and reading newspaper	117
Table 4.13	The mean score of HRV for good and weak reciters Pre-Post test	117
Table 4.14	The mean score of HRV based on good and weak reciters	118
Table 4.15	The mean score of BB for good reciters Pre-Post test	118

LIST OF FIGURES

Figure 2.1	Relationship between Quran recitation and HRV.	25
Figure 2.2	Heart Rate Variability.	30
Figure 2.3	A high HRV indicates high resilience and low stress.	30
Figure 2.4	Autonomic nervous system.	32
Figure 2.5	Power spectrum of the HRV waveform.	34
Figure 2.6	Change of heart rate with respiration.	35
Figure 2.7	Capnogram phases.	37
Figure 2.8	Capnography and Capnometry.	39
Figure 2.9	Effect reduction of O ₂ availability by 40% (red = mostly O ₂ , dark blue = least O ₂).	40
Figure 2.10	Relationship between reciting Quran and HRV, BB	42
Figure 2.11	The Conceptual Framework	44
Figure 3.1	HRV Research Design	48
Figure 3.2	BB Research Design	49
Figure 3.3	HRV Data Collection.	52
Figure 3.4	HRV protocol for session 1(Tjweed).	55
Figure 3.5	HRV protocol for session 2 (Story).	60
Figure 3.6	HRV protocol for session 3 (Theme).	62
Figure 3.7	HRV protocol for session 4 (understanding).	64
Figure 3.8	Breathing Behaviour Data Collection	66
Figure 3.9	HRV data analysis.	68
Figure 3.10	Breathing behaviour data analysis.	70
Figure 3.11	emWave PC tool	73
Figure 3.12	Ear sensor for emWave PC tool	74
Figure 3.13	PC screen of emWave	74
Figure 3.14	Image of the reciter During HRV.	75
Figure 3.15	The CapnoTrainer	76
Figure 3.16	PC screen of CapnoTrainer	77
Figure 3.17	Image of the reciter during BB.	78
Figure 3.18	Tajweed session coherence rate and average of heart rate results.	85
Figure 3.19	Tajweed session HRV power spectrum results.	86
Figure 3.20	Surah session coherence rate and average of heart rate results.	87
Figure 3.21	Surah session HRV power spectrum results.	88

Figure 4.1	Difference between GR and WR in number	94
Figure 4.2	Difference between GR and WR in percentage	95
Figure 4.3	Students with high HRV scores	97
Figure 4.4	Student with low HRV scores	97
Figure 4.5	Students with high HRV scores.	98
Figure 4.6	Students with low HRV scores.	98
Figure 4.7	The ACS and CR results for session 1(Tajweed).	100
Figure 4.8	Difference in HRV between total average of good and weak reciters.	100
Figure 4.9	The ACS and CR results for session 2 (story).	102
Figure 4.10	Difference between total average HRV scores of good and weak reciter students in session 2.	102
Figure 4.11	The ACS and CR results for session 3 (Theme).	104
Figure 4.12	Difference between total average HRV scores of good and weak reciter students in session 3.	104
Figure 4.13	The ACS and CR results for session 4 (Understanding).	106
Figure 4.14	Difference between HRV average scores for good and weak reciter students in session 4.	106
Figure 4.15	The CapnoTrianer screen record.	108
Figure 4.16	The difference between baseline, reading and the newspaper result.	109
Figure 4.17	The CR score of HRV.	112
Figure 4.18	Breathing behaviour results (B/min).	112
Figure 4.19	Effect of different verses and reading style on the emotions of the good and weak reciters	114
Figure 4.20	Effect of different verses and reading style on the emotions of the good and weak reciters.	115
Figure 4.21	Difference between good and weak reciters	115

LIST OF SYMBOLS

CO_2	Carbon dioxide
O_2	Oxygen

LIST OF ABBREVIATIONS

ACS	Accumulate Coherence Score
ANS	Autonomic Nervous System
ATP	Adenosine triphosphate
B/min	Breathe per minute
BB	Breathing Behaviour
BFB	Biofeedback
BR	Breathing Rate
BVP	Blood Volume Plus
CPR	Cardiopulmonary Resuscitation
CR	Coherence Ratio
DASS	Depression Anxiety Stress scale
EEG	Electroencephalography
ETCO ₂	End Tidal Carbon dioxide
GR	Good Reader
GSR	Galvanic Skin Response
HF	High Frequency
HR	Heart Rate
HRV	Heart Rate Variability
LF	Low Frequency
N-N	Normal to Normal interval
PaCO ₂	Partial pressure of CO ₂
PBUH	Peace Be Upon Him
pH	potential of hydrogen
PNS	Parasympathetic Nervous System
R-R	R wave to R wave
RSA	Respiratory Sinus Arrhythmia
SDNN	Standard Deviation of the Normal to Normal interval
SNS	Sympathetic Nervous System
TF	Total Frequency
UMP	University Malaysia Pahang
VLf	Very Low Frequency
WR	Weak reader

REFERENCES

- Aasman , J., Mulder , G., & Mulder, L. (1987). Operator effort and the measurement of heart rate variability. *Human Factors*, 29, 161-170.
- Abbas, N. H. (2009). *Quran 'Search for a Concept' Tool and Website*. (Master of Science), The University of Leeds School of Computing.
- Abdullah, A., & Omar, Z. (2011). *The Effect of Temporal EEG Signals while Listening to Quran Recitation*. Paper presented at the International Conference on Advanced Science, Engineering and Information Technology, Putrajaya, Malaysia.
- Abdurrochman, A., Wulandari, R. D., & Fatimah, N. (2007). *The Comparison of Classical Music, Relaxation Music andThe Qur'anic Recital: an AEP Study*. Paper presented at the The 2007 Regional Symposium on Biophysics and Medical Physic, Bogor, Indonesia.
- Abu Bakar, S. A. B. (2014). *Effects of Holy Quran Listening on Physiological Stress Response Among Muslim Patients in Intensive Care Unit*. Paper presented at the Conference on Management and Muamalah (CoMM 2014),, Malaysia.
- Ahmad, N., & Rana, A. (2015). Impact of Music on Mood: Empirical Investigation. *Research on Humanities and Social Sciences*, 5(21), 98-101.
- Al-Bukhari. (1996). *The English Translation of Sahih Al Bukhari With the Arabic Text (9 Volume Set)*. Translated by Muhammad Muhsin Khan, Book 25, hadeeth 5466: Al-Saadawi Publications.
- Al-Galal, S. A. Y., Alshaikhli, I. F. T., Rahman, A. W. b. A., & Dzul kifli, M. A. (2015). *EEG-based Emotion Recognition while Listening to Quran Recitation Compared with Relaxing Music Using Valence-Arousal Model*. Paper presented at the 4th International Conference on Advanced Computer Science Applications and Technologies (ACSAT), Kuala Lumpur, Malaysia.
- Al-Mahalli, J. A.-D., & Al-Suyuti, J. A.-D. (2007). *Tafsir Al-Jalalayn*. Amman, Jourdan: Royal Aal Al-Bayt Institute of Islamic Thought.
- Al-Tabari, M. J. (1994). *Tafeir Al-Tabari*. Riyad, Saia Arabia: Aalim Al-Kutub.
- Al-Zaben, A., Hamad, H., Alfahoum, A., & Saefan, W. (2014). Heart Rate Variability While Listening to Quran Recitation. *Arabian Journal for Science and Engineering*, 39(2), 1129-1133.

- Alsaboney, B. M. A. (2007). *The role of the Holy Quran on mental health in the life of the individual and the community*. Paper presented at the Quran between religion and medicine therapy, Abu Dhabi.
- Alshaikhli, I. F. T., Yahya, S. A., Pammusu, I., & Alarabi, K. F. (2017). *A study on the effects of EEG and ECG signals while listening to Quran recitation*. Paper presented at the The 5th International Conference on Information and communication Technology for The Muslim World (ICT4M), Kuching, Malaysia.
- Altman, T. (2017). CapnoTrainer® Biofeedback Technology.
- Amirfakhraei, A., & Alinaghizadeh, A. (2012). The impact of praying and fasting on the mental health of students attending the Bandar Abbas Branch of Islamic Azad University in Iran in 2012. *Life Science Journal*, 9(3), 2179-2184.
- Andreassi, J. L. (2007). *Psychophysiology: Human Behavior and Physiological Response* (5th ed.).
- Anthony, D., Jessina, C., Eli, N., Jon, P., Jingkun, Z., Dan, E., & Joseph, F. (2006). The Use and Interpretation of Quasi-Experimental Studies in Medical Informatics. *Journal of the American Medical Informatics Association*, 13(1), 16-23.
- Appelhans, B. M., & Luecken, L. J. (2006). Heart rate variability as an index of regulated emotional responding. *Review of General Psychology*, 10(3), 229-240.
- Ariff, M. S., Mai Ashikin, N. T., Maryamjameelah, R., Bushra, J., & Wan Azman, W. A. (2013). Pilot Study on the Effect of Yasiin Recitation on the Haemodynamics of Ventilated Patients. *The International Medical Journal Malaysia*, 12(2), 45-49.
- Azarpour, E., Moraditochaeab, M., & Bozorgia, H. R. (2014). Study medicinal plants in holy Quran *International Journal of Plant, Animal and Environmental Sciences*, 4(2).
- Azman, T., Mohd, S. A., Abdul, B. M. A., & Muhammad, A. (2014). *Themes-based classification for Al-Quran knowledge ontology*. Paper presented at the International Conference on Information and Communication Technology Convergence (ICTC), Busan, South Korea.
- Backs, R. W., & Seljos, K. A. (1994). Metabolic and cardiorespiratory measures of mental effort: the effects of level of difficulty in a working memory task. *International Journal of Psychophysiology*, 16(1), 57-68.
- Bakar, S. A. B. A. (2014, 26-27 May 2014). *Effects of Holy Quran Listening on Physiological Stress Response Among Muslim Patients in Intensive Care Unit*.

Paper presented at the E-proceedings of the Conference on Management and Muamalah, Department of Nursing Science Faculty of Management & Muamalah Kolej Universiti Islam Antarabangsa Selangor.

- Barrios-Choplin, B., McCraty, R., & Cryer, B. (1997). An inner quality approach to reducing stress and improving physical and emotional well-being at work. *Stress Medicine, 13*, 193-201.
- Bassampour, S., Zakerimoghadam, M., Faghihzadeh, S., & Goudarzi, F. (2008). The effect of organized auditory stimulations on the consciousness level of comatose patients. *Hayat, 13*(4), 15-22.
- Bennett, T., Farquhar, I. K., Hosking, D. J., & Hampton, J. R. (1978). Assessment of methods for estimating autonomic nervous control of the heart in patients with diabetes mellitus *Diabetes, 27*, 1167-1174.
- Benson, H. (1976). *relaxation response*: HarperCollinse Publisher Inc.
- Berntson, G., Thomas, J. J., Eckberg, L., Grossman, P., Kaufmann, G., Marek, M., . . . Maurots, W. (1997). Heart rate variability: Origins, methods, and interpretive caveats. *Psychophysiology, 34*(6), 623–648.
- Berntson, G. G., Cacioppo, J. T., & Quigley, K. S. (1993). Cardiac psychophysiology and autonomic space in humans: empirical perspectives and conceptual implications. *Psychol Bull., 114*(2), 296-322.
- Bhattacharya, J., & Petsche, H. (2001). Universality in the brain while listening to music. *PMC Journals ,Articles from Proceedings of the Royal Society B: Biological Sciences are provided here courtesy of The Royal Society, 268*, 2425-2426.
- Bickman, L., & Rog, D. J. (2009). *The SAGE Handbook of Applied Social Research Methods* (2nd ed.). USA: SAGE Publications Inc.
- Billman, G. (2011). Heartratevariability–ahistoricalperspective. *journal frontiers in physiology, 2*(86), 1-13. doi: 10.3389/fphys.2011.00086
- Boyd-Brewer, C., & McCaffrey, R. (2004). Vibroacoustic Sound Therapy Improves Pain Management and More. *Holistic Nursing Practice, 18*(3), 111-118.
- Breathing.com <http://www.breathing.com/articles/carbon-dioxide.htm> (1997-2016).
- Brown, R., Pressley, M., Van Meter, P., & Schuder, T. (1996). A quasi-experimental validation of transactional strategies instruction with low-achieving second-grade readers. *Journal of Educational Psychology, 88*(1), 18-37.

- Brown, T., Chorpita, B., Korotitsch, W., & Barlow, D. (1997). Psychometric properties of the Depression Anxiety Stress Scales (DASS) in clinical samples. *Behaviour Research & Therapy*, 35, 79-89.
- Cohen, K. S. (1997). *The Way of Qigong: The Art and Science of Chinese Energy Healing*. New York: Ballantine Books.
- Courtney, R., Cohen, M., & Dixhoorn, J. V. (2011). Relationship Between Dysfunctional Breathing Patterns and Ability to Achieve Target Heart Rate Variability with Features of Coherence During Biofeedback. *Alternative Therapies*, 17(3), 38-44.
- D'Urbano, J. (2011). Breathing Patterns. BreathSounds.
- Darabinia, M., Gorji, A. M. H., & Afzali, M. A. (2017). The effect of the Quran recitation on mental health of the Iranian medical staff. *Journal of Nursing Education and Practice*, 7(11), 30-36.
- DeOliveira, A. M., Buchain, P. C., Vizzotto, A. D., Elkis, H., & Cordeiro, Q. (2013). Psychosocial Impact. In Marc D. Gellman & J. R. Turner (Eds.), *Encyclopedia of Behavioral Medicine*. New York, NY: Springer.
- Donald, T. C., & Laurence, H. R. (1968). The Connecticut Crackdown on Speeding: Time-Series Data in Quasi-Experimental Analysis *Law & Society Review*, 3(1), 33-54
- Duschek, S., Muckenthaler, M., Werner, N., & Reyes del Paso, G. A. (2009). Relationships between features of autonomic cardiovascular control and cognitive performance. *Biological Psychology*, 81, 110-117.
- Erkkilä, J., Punkanen, M., Jörg Fachner, E. A.-R., Pöntiö, I., Tervaniemi, M., Vanhala, M., & Gold, C. (2011). Individual music therapy for depression: randomised controlled trial. *The British Journal of Psychiatry*, 199(2).
- Fernald, L. D. (2008). *Psychology: Six perspectives* Thousand Oaks, CA: Sage Publications.
- Ferreira, J. C., & Patino, C. M. (2015). What does the p value really mean? *J Bras Pneumol*, 41(5), 485-485.
- Foran, L. M. (2009). Listening to Music: Helping Children Regulate Their Emotions and Improve Learning in the Classroom. *Educational Horizons*, 51-58.
- Fujimura, T., & Okanoya, K. (2012). Heart Rate Variability Predicts Emotional Flexibility in Response to Positive Stimuli. *Psychology Scintific Research*, 3(8), 578-582.

- Gautam, S. K., Goswami, B., Jain, A., Mondol, S., & Gandhi, A. (2015). Effect of music on the stress and anxiety scores of students attending medical college. *Asian Journal of Biomedical and Pharmaceutical Sciences*, 5(45), 33-36. doi: doi: 10.15272
- Gemmert, A. W. A. V., & Galen, G. P. V. (1997). Stress, Neuromotor Noise, and Human Performance: A Theoretical Perspective. *Journal of Experimental Psychology: Human Perception and Performance*, 23(5), 1299-1313.
- Hansen, A. L., Johnsen, B. H., & Thayer, J. F. (2003). Vagal influence on working memory and attention. *Int. J. Psychophysiol.*, 48, 263–274.
- Harris, A. D., McGregor, J. C., Perencevich, E. N., Furuno, J. P., Zhu, J., & Finkelstein, J. (2006). The Use and Interpretation of Quasi-Experimental Studies in Medical Informatics. *J Am Med Inform Assoc.*, 13(1), 16–23. doi: doi: 10.1197/jamia.M1749
- Heidari, M., Shahbazi, S., & Bahrami, A. (2014). Assess the effect of Quran on exam anxiety in nursing and ems students. *International Journal of Review in Life Sciences*, 4(2), 51-56.
- Henry, J. D., & Crawford, J. R. (2005). The short-form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large nonclinical sample. *British Journal of Clinical Psychology*, 44, 227-239.
- HeratMath. (2016). The science behind the emwave® and inner balance™ technologies. . from HeartMath Institute.org
- Hirsch, J. A., & Bishop, B. (1981). Respiratory sinus arrhythmia in humans: How breathing patterns modulate heart rate *Am J Physiol*, 10, H620-H629.
- Hockenbury, & Hockenbury. (2010). *Psychology*. USA: Worth Publishers.
- Horton, R., Bustamante, R. M., Edmonson, S. L., & Slate, J. R. (2011). Music and Student Performance: A Conceptual Analysis of the Literature. *The Online Journal of New Horizons in Education*, 4(2), 72-90.
- Hu, X. (2010). *Music and Mood: Where Theory and Reality Meet*. University of Illinois at Urbana-Champaign.
- ImâmHâfiz Abu Dawud, S. (2008). *English Translation of Sunan Abu Dawud* (Y. Qadhi, Trans. 1st ed.). Riyadh: Darussalam
- Jaberi, A. A., Bonabi, T. N., Anari, A. R. S., & Hasani, P. A. (2005). The effect of the koran reciting on the depressed patients in psychiatry department of Moradi hospital in Rafsanjan SJKU. *Scientific Journal of Kurdistan University of Medical Sciences*, 10(2), 42-48.

- Kaminoff, L. (2006). What Yoga Therapists Should Know About the Anatomy of Breathing. *The Art of Personal Sādhana*.
- Khan. (1997). *The Translation of the meaning of Sahih Al-Bukhari*. Riyadh, Kingdom of Saudi Arabia: Darussalam Publishers and Distributors
- Khan, Ahmad, N. b., Abd Alla, A. N., & Nubli, M. (2010). *Mental and Spiritual Relaxation by Recitation of the Holy Quran* Paper presented at the Second International Conference on Computer Research and Development.
- Kim, J., Wigram, T., & Gold, C. (2009). Emotional, motivational and interpersonal responsiveness of children with autism in improvisational music therapy. *Autism, 13*(4), 389-409.
- Kimberlin , C. L., & Winterstein, A. G. (2008). Validity and reliability of measurement instruments used in research. *Am J Health-Syst Pharm, 65*, 2276-2283.
- Klaudia, P., Agata, F., Katarzyna, C., Zbigniew, S., & Piotr, J. (2013). The Changes of Heart Rate Variability in Response to Deep Breathing in Professional Swimmers. *Folia Medica Cracoviensia, LIII*(2), 43-52.
- Krishnan, M., Kabali, B., & Badanidiyur, V. R. (2011). Heart Rate Variability In Normotensive Subjects With Family History of Hypertension. *Indian J Physiol Pharmacol, 55*(3), 253-261.
- Lehrer, Vaschillo, E., & Vaschillo, B. (2000). Resonant frequency biofeedback training to increase cardiac variability: rationale and manual for training. *Appl Psychophysiol Biofeedback, 25*(3), 177-191.
- Lehrer, P. M. (2007). Biofeedback training to increase heart rate variability. In W. S. P. Lehrer, & R. L. Woolfolk (Ed.), *Principles and practice of stress management* (3rd ed ed., pp. 227–248). New York: Guilford Press.
- Lehrer, P. M., Hochron, S., Mayne, T. M., Isenberg, S., Lasoski, A. M., Carlson, V., . . . Porges, S. (1997). Relationship between changes in EMG and respiratory sinus arrhythmia in a study of relaxation therapy for asthma. *Applied Psychophysiology and Biofeedback, 22*(3), 183–191.
- Lehrer, P. M., & Vaschillo, E. G. (2001). Resonant frequency heart rate biofeedback: Effects on cardiovascular and baroreflex function. *Biological Psychology, 56*.
- Lippi, D., Sarsina, P. R. d., & D’Elios, J. P. (2010). Music and medicine. *Journal of Multidisciplinary Healthcare, 3*, 137—141.
- Litchfield, P. M. (2003). A Brief Overview of The Chemistry of Respiration and The Breathing Heart Wave. *California Biofeedback, 19*(1), 1-11.

- Litchfield, P. M. (2010). CapnoLearning: Respiratory Fitness and Acid-Base Regulation. *Psychophysiology Today*, Vol. 7, No. 1., 7(1), 1-6.
- Lopes, T. C., Beda, A., Granja-Filho, P. C. N., Jandre, F. C., & Giannella-Neto, A. (2011). Cardio-respiratory interactions and relocation of heartbeats within the respiratory cycle during spontaneous and paced breathing. *Physiological Measurement*, 32(9), 1389-1402.
- Loukas, M., Saad, Y., Tubbs, R. S., & Shoja, M. M. (2010). The heart and cardiovascular system in the Qur'an and Hadeeth. *International Journal of Cardiology*, 140(1), 19-23.
- Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, 33, 335-343.
- Mackay, J. D., Page, M., Cambridge, P., & Watkins, P. (1980). Watkins Diabetic autonomic neuropathy, The diagnostic value of heart rate monitoring. *Diabetologia*, 18, 471-478.
- Mahjoob, M., Nejati, J., Hosseini, A., & Bakhshani, N. M. (2016). The Effect of Holy Quran Voice on Mental Health. *J Relig Health*, 55(1), 38-42. doi: 10.1007/s10943-014-9821-7
- Majidi, S. (2004). Recitation Effect of Holy Quran on Anxiety of Patients before Undergoing Coronary Artery Angiography. *Journal of Guilan University of Medical Sciences*, 13(49), 61-67.
- Makay, J., & Chatham. (2003). *science of breathing*. London L.N Fowler and co.LTD- 29 Ludgate hill London, E.C.4.
- Mansouri, A., Vahed, A. S., Sabouri, A. R., Lakzaei, H., & Arbabisarjou, A. (2017). Investigating Aid Effect of Holy Quran Sound on Blood Pressure, Pulse, Respiration and O2 Sat in ICU Patients. *International Journal of Scientific Study*, 5(7), 218-222.
- McCraty, R., Atkinson, M., & Tomasino, D. (2003). Impact of a workplace stress reduction program on blood pressure and emotional health in hypertensive employees. *J. Altern. Complement. Med.*, 9 355–369.
- McCraty, R., Atkinson, M., Tomasino, D., & Stuppy, W. P. (2001). Analysis of twenty-four hour heart rate variability in patients with panic disorder. *Biol Psychol.*, 56(2), 131-150.

- McCraty, R., Choplin, B. B., Atkinson, M., & Tomasion, D. (1998). The Effect of Different Type of Music on Mood, Tension, and Mental Clarity. *Alternative therapies*, 4(1), 75-84.
- McCraty, R., Dana, T., Mike, A., Pam, A., & Stephen, J. (2000). *Improving test-taking skills and academic performance in high school students using HeartMath learning enhancement tools*: Institute of HeartMath, Boulder Creek, CA.
- 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., & Tomasino, D. (2004, 2-5 November 2004). *Heart rhythm coherence feedback: A new tool for stress reduction, rehabilitation, and performance enhancement*. Paper presented at the Proceedings of the First Baltic Forum on Neuronal Regulation and Biofeedback, Riga, Latvia,.
- Mohammad Esam, M. (1998). الواضح في أحكام التجويد. Jordan: Dar Alnafaees.
- Moser, M., Lehofer, M., Hoehn-Saric, R., McLeod, D., Hildebrandt, G., Steinbrenner, B., . . . Zapotoczky, H. (1998). Increased heart rate in depressed subjects in spite of unchanged autonomic balance? *Journal of Affective Disorders*, 48(2-3), 115-124.
- Mottaghi, M., Esmaili, R., & Rohani, Z. (2011). Effect of Quran recitation on the level of anxiety in athletics. *Quarterly of Quran & Medicine*, 1(1), 1-4.
- Muench, F. (2008). The Portable StressEraser Heart Rate Variability Biofeedback Device: Background and Research. *Psychophysiology & Biofeedback*, 36(1), 35-39.
- Musa, R., Fadzil, M. A., & Zain, Z. (2007). Translation, validation and psychometric properties of Bahasa Malaysia version of the Depression Anxiety and Stress Scales (DASS). *Asean J. Psychiatr*, 8(2), 82-89.
- Nakamura, S., Sadato, N., Oohashi, T., Nishina, E., Fuwamoto, Y., & Yonekura, Y. (1999). Analysis of music-brain interaction with simultaneous measurement of regional cerebral blood flow and electroencephalogram beta rhythm in human subjects. *Elsevier Science Ireland Ltd, Neuroscience Letters*, 275, 222-226.
- Nakhavali, F., & Seyedi, S. H. (2013). A Research on “Rhythm & Music” in the Qur’an. *International Journal of Linguistics*, 5(3), 21-27.
- Naseem, Z., & Khalid, R. (2010). Positive Thinking in Coping with Stress and Health outcomes: Literature Review. *Journal of Research and Reflections in Education*, 4(1), 42-61.

- Noh, M. A. C., Tamuri, A. H., Razak, K. A., & Suhid, A. (2014). The Study of Quranic Teaching and Learning: United Kingdom Experience. *Mediterranean Journal of Social Sciences*, 5(16), 313-317.
- Paramedicine. (2009). End Tidal CO2. from http://www.paramedicine.com/pmc/End_Tidal_CO2.html
- Pashib, M., Khaqani, F., Bahrainian, A., & Abedi, A. (2014). Investigation of the Effectiveness of Quran Recitation and Teachings on Depression of Female Students of Torbat-E-Heidariye University. *Journal of Applied Environmental and Biological Sciences*, 4(12), 137-140.
- Pekrun, R. (2014). Emotions and Learning. *International Academy of Education, Educational Practice series-24*.
- Pignotti, M., & Steinberg, M. (2001). Heart rate variability as an outcome measure for Thought Field Therapy in clinical practice. *J Clin Psychol.*, 27(10), 1193-1206.
- Porges, S. (1992). Vagal tone: A physiologic marker of stress vulnerability. *Pediatrics*, 90(3), 498-504.
- Porges, S. W. (1995). Orienting in a defensive world: mammalian modifications of our evolutionary heritage. A Polyvagal Theory. *Psychophysiology*, 32(4), 301-318.
- Prinsloo, G. E., Derman, W. E., Lambert, M. I., & Rauch, H. G. L. (2013). The Effect of a Single Session of Short Duration Biofeedback- Induced Deep Breathing on Measures of Heart Rate Variability During Laboratory-Induced Cognitive Stress: A Pilot Study. *Appl Psychophysiol Biofeedback*, 38, 81-90.
- Rastogi, R., & Silver, E. (2014). Association of Music with Stress, Test Anxiety, and Test Grades Among High School Students. *Journal of Young Investigators*, 26(5), 32-38.
- Rea, C., McDonald, P., & Carnes, G. (2010). Listening to classical, pop, and metal music: An investigation of mood. *Emporia State Research Studies*, 46(1), 1-3.
- Redmond, W. (2010). *Operating Instructions*.
- Reiner, R. (2008). Integrating a portable biofeedback device into Clinical practice for patients with anxiety disorders: results of a pilot study. *Appl. Psychophysiol. Biofeedback*, 33, 55-61
- 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.), Alliant International University, USA.

- Reyes, F. J. (2014). Implementing heart rate variability biofeedback groups for veterans with posttraumatic stress disorder. *Biofeedback*, 42(4), 137-142.
- Riffe, D., Lacy, S., & Fico, F. G. (2005). *Analyzing media messages: Using quantitative content analysis in research*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Ross, M. W. (2011). *The Evolution of Education: Use of Biofeedback in Developing Heart Intelligence in a High School Setting*. (Doctoral dissertation), University of Calgary, Alberta, USA.
- Ryan-Wenger, N. H., Sharrer, V. W., & Campbell, K. K. (2005). Changes in children's stressors over the past 30 years. *Pediatric Nursing*, 31, 282-290.
- Ryan Douglas Detty, M. E. (2013). *Music and Students with Emotional Behavioral Disorders*. (Master of Education), Ohio University.
- Saarikallio, S. (2007). *Music as Mood Regulation In Adolescence*. University of Jyväskylä, University Library of Jyväskylä.
- Safara, M., & Samanesadatsadidpoor. (2014). The Effect of Spiritual Music on Health in Different Religions. *Delhi Psychiatry Journal*, 17(1), 134-137.
- Salam, U. B., Wahab, M. N. A., & Ibrahim, A. B. (2013). Potentiality of taubah (Islamic repentance) and listening to the Holy Quran recitation on galvanic skin response. *International Journal of Psychology and Counselling*, 5(2), 33-37.
- Sarwari, A. Q., & Abdul Wahab, M. N. (2017). The Effectiveness of HRV-Biofeedback Technology and Heart Rate Variability on Intercultural Communication Competence among Postgraduate Students from Different Nationalities. *The International Journal Of Humanities & Social Studies*, 5(10), 201-209.
- Schneiderman, N., Ironson, G., & Siegel, S. D. (2005). Stress and health: psychological, behavioral, and biological determinants. *Annu Rev Clin Psychol.*, 1, 607–628.
- Selye, H. (1956). *The stress of life*. New York: McGraw-Hill Book Co.
- Shaikh, Z. K. (2009). *Studying the Effects of Listening to Quran on Human Mood*. (Master of Science in Information Technology), The British University in Dubai, Dubai.
- Sharma, T., & Kapoor, B. (2014). Data Analysis by using Machine Learning Algorithm on Controller for Estimating Emotions. *International Journal on Computational Sciences & Applications (IJCSA)*, 4(6).
- Sharrer, V. W., & Ryan-Wenger, N. A. (2002). School-age children's self-reported stress symptoms. *Pediatric Nursing*, 28(1), 21-27.

- Shauna, L., ShapiroGary, E., & SchwartzGinny, B. (1998). Effects of Mindfulness-Based Stress Reduction on Medical and Premedical Students. *Journal of Behavioral Medicine*, 21(6), 581–599.
- Shekha, M., Hassan, A., & Othman, S. (2013). Effects of Quran listining and music on Electroencephalogram brain waves. . *Egypt. J. Exp. Biol*, 9(1), 1-7.
- Skybo, T. (2005). Witnessing violence: biopsychosocial impact on children. *Pediatr Nurs.*, 31(4), 263-270.
- Sood, R., Sood, A., Wolf, S. L., Linqvist, B. M., Liu, H., Sloan, J. A., . . . Barton, D. L. (2013). Paced breathing compared with usual breathing for hot flashes. *Menopause*, 20(2), 179-184.
- Strack, B. W. (2003). *Effect of heart rate variability (HRV) biofeedback on batting performance in baseball*. Dissertation Abstracts International: Section B: The Sciences and Engineering, 64(3-B), 1540.
- Sun, Y., Yu, X., & Berilla, J. (2013). *An Innovative Non-invasive ECG Sensor and Comparison Study with Clinic System*. Paper presented at the 39th Annual Northeast Bioengineering Conference, Sheraton Syracuse University Hotel and Conference Center 801 University Avenue Syracuse, NY, USA.
- Sutarto, A. P., & Abdul Wahab, M. N. (2008). *Biofeedback Technique for improving Human Operators' Cognitive Performance*. Paper presented at the Fifth International Cyberspace Conference on Ergonomics, Sarawak, Malaysia. .
- Suvorov, N. (2006). Psychophysiological training of operators in adaptive biofeedback cardiorhythm control. *Span J Psychol.*, 9(2), 193-200.
- Tanis, C. (2008). *The effects of heart rhythm variability biofeedback with emotional regulation on the athletic performance of women collegiate volleyball players*. (PhD doctoral dissertation), Capella University, Minneapolis, MN.
- Task-Force-of-The-European-Society. (1996). Heart rate variability: Standards of measurement, physiological interpretation, and clinical use. *European Heart Journal*, 17, 354–381.
- Thomas, J. K. (2003). *A Quasi-Experimental Estimate of The Impact of Financial Aid on College-Going*. Cambridge, MA 02138
- Thurber, M. R. (2006). *Effects of Heart-Rate Variability Biofeedback Training and Emotional Regulation on Music Performance Anxiety in University Students*. (Doctor of Philosophy), University of North Texas.

- Tiller, W. A., McCraty, R., & Atkinson, M. (1996). Cardiac coherence: A new, noninvasive measure of autonomic nervous system order. *Alternative Therapies in Health and Medicine*, 2(1), 52-65.
- Tran, T. D., Tran, T., & Fisher, J. (2013). Validation of the depression anxiety stress scales (DASS) 21 as a screening instrument for depression and anxiety in a rural community-based cohort of northern Vietnamese women. *BMC Psychiatry*, 13(24), 1-7.
- Tumiran, M. A., Mohamad, S. P., Saat, R. M., Yusoff, M. Y. Z. M., Rahman, N. N. A., & Adli, D. S. H. (2013). Addressing sleep disorder of autistic children with Qur'anic sound therapy. 5, 73-79.
- Tyagi, A., & Cohen, M. (2016). Yoga and heart rate variability: A comprehensive review of the literature. *Int J Yoga*, 9(2), 97-113.
- Vaschillo, E. G., Zingerman, A. M., Konstantinov, M. A., & Menitsky, D. N. (1983). Research of the resonance characteristics for cardiovascular system. *Human Physiology*, 9, 257-265.
- Veena, H. C., Vijayanath, I., Takalikal, R. H., & Patil, R. S. (2013). Effect of deep breathing on heart rate variability in normotensive male offspring's of hypertensive parents. *Indian Journal of Applied Basic Medical Sciences*, 15b(21), 80-88.
- Vella, E. J., Irvin, M. D., Solle, J., Berendt, S., & Ramirez, E. E. (1999). The Effect of Music on Mood and Perception of a Visual Stimulus. *Journal of Undergraduate Research*, 4(3), 101-105.
- Wegerif, S. (2013). Measurement of HRV.
- White, H., & Sabarwal, S. (2014). *Quasi-experimental Design and Methods, Methodological Briefs: Impact Evaluation* 8. Florence: UNICEF Office of Research.
- Whited, A., Larkin, K. T., & Whited, M. (2014). Effectiveness of emWave biofeedback in improving heart rate variability reactivity to and recovery from stress. *Appl Psychophysiol Biofeedback*, 39, 75-88.
- Wiersma, W., & Jurs, S. G. (2005). *Research methods in education* (8th ed.). Boston, MA: Pearson Education.
- Wollburg, E., Roth, W. T., & Kim, S. (2011). Effects of breathing training on voluntary hypo- and hyperventilation in patients with panic disorder and episodic anxiety. *Appl Psychophysiol Biofeedback*, 36(2), 81-91.

- Xiao, M., Zi-Qi, Y., Zhu-Qing, G., Hong, Z., Nai-Yue, D., Yu-Tong, S., . . . You-Fa, L. (2017). The Effect of Diaphragmatic Breathing on Attention, Negative Affect and Stress in Healthy Adults. *Front Psychol.*, 8.
- Zakaria bin Muhammad, A.-A. A.-S. (1995). الدقائق المحكمة في شرح المقدمة الجزرية في علم التجويد. Damascus, Syria: Darul Al-Maktabi.
- Zayd, N. A. (2000). The Qur'an: God and Man in Communication: Leiden University, The Netherlands.
- Zeinali, A., Pour, H. F., Fattahi, M., Kalani, L. K., & Fattahi, M. (2014). The Effect of Quranic Mentality Program on Mental Health of Students of Urmia University of Medial Sciences (Ramadan 2012). *Islam Life Center Health*, 1(4).