

## LITERATURE AND EMOTIONS AN EMPIRICAL TEST THROUGH HRV BIOFEEDBACK AT TAIBAH UNIVERSITY

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**ABSTRACT:** *Emotions create literature and literature expresses emotions. Following this proposition, the current study examines the relative effect of "Waiting for Godot" and "Dr. Faustus" towards the peruser's feelings through HRV biofeedback. The objective of the study is: to determine the comparative impact of "Waiting for Godot" and "Dr. Faustus" towards HRV of the perusers. An aggregate number of 66 members was equally grouped in 3 batches and each member was given the Scripts in Original Text, Paraphrase and Arabic Translation for the maximal cognizance of the messages of the plays and resultantly the optimum excitement of the feelings. Photoplethysmograph Ear Sensor was clung to one of the earlobes of the peruser from one side while its other side was connected to the emWave programme to record the HRV of the peruser. The outcomes exhibit that the two plays influence the feelings of their respective perusers in a different way. The HRV power spectrum demonstrates that the VLF ratio of the perusers of Script 1 rises while LF, HF, Achievement, Coherence and LF/HF Ratio diminish. On the other hand, for Script 2, VLF rate of the perusers diminishes while LF, HF, Achievement, Coherence and LF/HF Ratio rise. From these outcomes, it is unmistakably clear that a piece of literature which talks against the religion of the Muslim perusers makes a negative effect on their feelings and they feel stressed. On the other hand, the writing which passes on the message supporting the religious philosophy of the Muslim perusers positively influences their feelings and they feel relaxed. In general, the consequences of the study demonstrate the concomitant relationship between literature and emotions.*

**KEYWORDS:** Literature and Emotions, HRV Biofeedback, Emotions Measurement, Antithetical themes in "Dr. Faustus" and "Waiting for Godot"

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### INTRODUCTION

The main focus of literature is emotions. Different studies have been conducted on the impact of literary writings on human feelings. Bal and Veltkamp (Bal and Veltkamp, 2013) examined the emotive reactions produced by reading the literary works. The peruser recognizes himself with the anecdotal characters (Oatley, 2012). At that point what happens in a piece of writing is specifically identified with feelings (Green, Garst, and Brock, 2004). There is empathy in feelings: the occasions and activities in fiction or a piece of writing contain feelings and identical feelings are stirred in the peruser (Bal and Veltkamp, 2013). Greek tragedy totally harps on control of feelings of compassion and apprehension to have purgation (Stanford, 2014). William Wordsworth characterizes verse as "a spontaneous overflow of powerful

emotions recollected in tranquility” (Wordsworth, Coleridge, and Mason, 2007). In spite of contentions among play critics concerning the hypothetical position and the points, the key role enacted by feelings is by all accounts a typical angle to most meanings of dramatization (Damiano and Pizzo, 2008). Feelings assume a key part in comprehension of literary books. A work of literature should be experienced emotionally for its legitimate comprehension. An exhaustive study “The Reef” a novel by Edith Wharton shows as to how a piece of great fiction tends to educate the reader by means of instinctive emotional responses, and then leading to cognitive and reflective monitoring (Robinson, 2005). Moreover, it has been encouraged by the literary theory that “ literature is cultural production”(Shaikh, 2016). Literary work gives us a generally un-assessable acumen into the ways feelings are created, experienced, and executed in human social life. It is especially profitable in light of the fact that it develops our appreciation of the shared relations between emotional reaction and moral judgment (Hogan, 2011).

The connection amongst art and feeling is profound and variegated (Cupchik, 2006). Artists seduce oblivious distraction with feelings when talking about their work (Djicic et al., 2006). On their side, perusers experience feelings in empathy with characters they read about (Oatley, 1999; Oatley et al., 2006), over the span of reenacting the arrangements and occasions of a piece of fiction. The feelings provoked by craftsmanship are not substandard as compared to the feelings experienced in different settings. In spite of the fact that the more extreme feelings of human disaster and delight, in actuality, are not coordinated by those of perusing short stories, and in spite of the fact that the feelings individuals report amid perusing of fiction are - as a rule - of shorter term, they are not antithetical in kind or force from those individuals ordinarily record in journal investigations of feelings in regular life (Oatley and Duncan, 1994).

There is a great controversy over the number of emotions and their nature (Oatley, Keltner, and Jenkins, 2006; Nesse, 2009). There are theories that emphasize only on negative and positive states of emotions. Some people dwell upon “basic” emotions which is relatively a smaller set; and there are even others who believe in countless number of emotions. In spite of differences, almost all the theorists approve of valence that is an essential characteristic of emotions. “Pain and pleasure; approach and avoidance” are central around which all the emotions whatsoever revolve (Barrett, 2006b; Rolls, 2005). However, most of theorists think that only two aspects of emotions are inadequate to translate diverse emotional experiences (Fontaine, Scherer, Roesch, and Ellsworth, 2007). Darwin and his predecessors (Sorabji, 2000) came up with a few “qualitatively distinct emotions” which are instinctive, natural and universal in their kinds. Table 1 shows a list of some Primary, Secondary and Tertiary emotions.

**Table 1: Emotions’ List**

Primary emotions	Secondary emotions	Tertiary emotions
Love	Affection	Adoration, affection, love, fondness, Sentimentality, compassion, tenderness, caring, attraction, liking.
	Lust	Passion, infatuation, arousal, desire, lust,
	Longing	Longing
Joy	Cheerfulness	Amusement, bliss, euphoria, jubilation, gladness, enjoyment, happiness, ecstasy, satisfaction, cheerfulness, elation, joy, joviality, delight, glee,

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		gaiety, jolliness. Excitement, thrill, exhilaration, zest, zeal, enthusiasm.
	Zest	
	Contentment	Pleasure, contentment
	Pride	Triumph, pride,
	Optimism	Hope, optimism, eagerness,
	Enthrallment	Rapture, enthrallment
Surprise	Relief	Relief
	Surprise	Astonishment, amazement, surprise
	Irritation	Aggravation, agitation, irritation, grumpiness, grouchiness, annoyance.
Anger	Exasperation	Frustration, exasperation
	Rage	Anger, resentment, rage, vengefulness, dislike, spite, outrage, scorn, fury, loathing, wrath, hate, bitterness, hostility, ferocity
	Disgust	Contempt, disgust, revulsion
	Envy	Envy, jealousy
	Torment	Agony, torture, torment
	Suffering	Agony, suffering, hurt, pain, anguish
Sadness	Sadness	Melancholy, misery, woe, sorrow, grief, unhappiness, sadness, glumness, gloom, despair, hopelessness, depression
	Disappointment	Disappointment, dismay, displeasure
	Shame	Regret, guilt, remorse, shame
	Neglect	Insult, humiliation, embarrassment, dejection, insecurity, defeat, alienation, homesickness, rejection, loneliness, isolation, neglect
	Sympathy	Empathy, pity, compassion, sympathy
Fear	Horror	Mortification, hysteria, horror, fear, fright, shock, terror, alarm, panic
	Nervousness	Dread, distress, worry, tenseness, apprehension, nervousness, uneasiness, anxiety

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Source: (Parrott, 2001)

Is it possible to prove empirically the link between literature and emotions? To answer this question, a study was conducted at Taibah University, Madinah Munawwarah, Saudi Arabia. The objective of the study was: to determine the impact of “Dr. Faustus” and “Waiting for Godot” towards HRV of the readers. HRV Biofeedback, which is basically meant to record the psychophysiological responses of the body, was used to record the variations in the heart rate of the readers of literature. Very Low Frequency (VLF), in the HRV Power Spectrum, indicates that the sympathetic branch of the ANS (Autonomic Nervous System) is activated and the person is feeling stressed. On the other hand, High Frequency (HF) shows that the parasympathetic branch of the ANS (Autonomic Nervous System) is triggered and the person is feeling relaxed. Low Frequency (LF) is Sympathetic as well as Parasympathetic activity of the Autonomic Nervous System. The typical changeability in heart rate is because of the synergistic activity of Sympathetic and Parasympathetic branches of the Autonomic Nervous System, which functions in equivalence through humoral, neural, mechanical, and other physiological components to save parameters relating to cardiovascular issues in their ideal ranges and to allow suitable responses to altering outer or interior circumstances (McCraty, 2001). In this manner, the heart rate assessed at any given time mirrors the net impact of the parasympathetic (vagus) nerves in a sound and healthy individual, which moderate heart rate, and the sympathetic nerves quickens it. These progressions are biased by feelings, considerations and physical activity. Changes in heart rhythms influence the heart as well as the mind's expertise to create data, including basic leadership, critical thinking and inventiveness. They likewise have a straight influence on the feelings. High vagal tone (parasympathetic) is connected with the capacity to self-direct and in this way to have more prominent behavioral adaptability and versatility in an evolving domain. Then again, low vagal tone is connected with poor self-control and an absence of behavioral adaptability (Porges, 1992). Hence, the investigation of HRV is a capable, objective, and noninvasive apparatus to gauge neurocardiac capacity that reflects heart–brain associations and ANS elements (Cardiology, 1996). The investigation of HRV can be utilized to decide the dynamic communications between physiological, mental, emotional and behavioral procedures (McCraty & Tomasino, 2004).

## **METHODS**

### **Subjects**

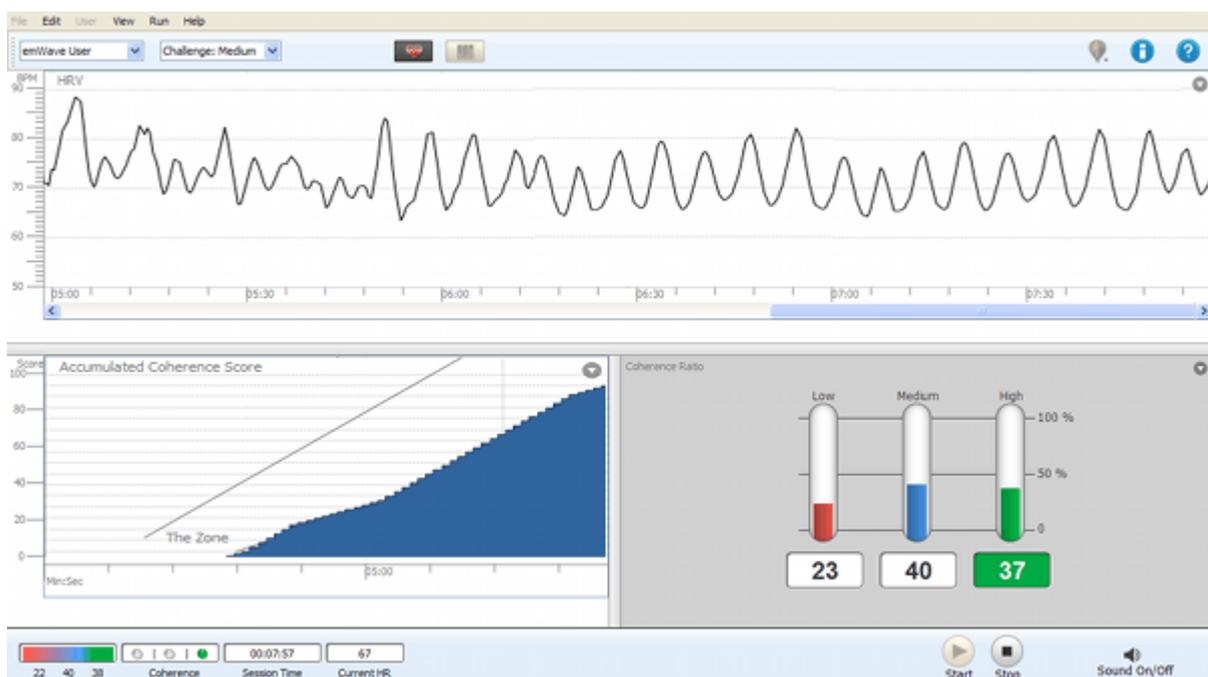
The research participants were 66 undergraduate male students at Taibah University, Madinah Munawwarah, Kingdom of Saudi Arabia. There were a few reasons for the selection of this university for the experimental purposes. First of all, the researcher has been teaching English language and literature in this university for the last fifteen years. So, it was convenient for him to select such an institution where he has been working for a long time. The Saudi students often complain about the religious and cultural irritants in English literature. The researcher wanted to examine the impact of English literature on the emotions of the readers specifically the Muslim readers. Moreover, both the plays-“Dr. Faustus” and “Waiting for Godot”- are the part of the courses offered by the Department of Languages and Translation, College of Arts and Humanities, Taibah University, where the researcher is a faculty member and has taught both the plays several times.

Disproportionate Stratified Sampling method was used in the study. To maintain the homogeneity of the sample, all the subjects were male Muslim Saudi undergraduates in their third year study programme at Taibah University. To ensure that samples are competent in reading literature, their performance in literature courses was examined. Inclusionary criteria and exclusionary criteria were chalked out in the announcement of registration. No student was included in the study who had not studied Play-I and Play-II. Three groups were made on the basis of their marks they obtained in the University Exams in Play-1 or Play-2. The first group, consisting of 22 participants, was of the students who secured 90-100 marks. They were given the Original Text Scripts of the plays. The second group- 22 participants- were given Paraphrase Scripts of the plays. They scored 75-89 marks. The third group-who received 60-74 marks in the exams in Play-1 or Play-2-was given Arabic Translation Scripts of the plays. They were also 22 participants.

Before the start of data collection, the participants read and signed the informed consent. The informed consents stated the nature of study, the benefits and risks of participating in the study, and the option of the participants to disengage with the study whenever they wish to do so. It also stated that all the data obtained from the subjects would be confidential and would be available upon their request.

### Instruments

For the purpose of this study, physiological measurements were recorded from emWave desktop coherence training software version 2.2.4.4893, developed by Heartmath LLC. This instrument was used in all sessions to record HRV of the subjects. A 16-inch laptop screen presented beat to beat curve, instantaneous heart rate, and spectrum of heart rate, as biofeedback information of the subjects (Figure 1). The cardiovascular data was obtained from photoplethysmograph ear sensor. Data was collected by attaching the photoplethysmograph sensor to the ear lobe of the subject. Heart rate measures were recorded from beat to beat intervals.



**Figure 1:** Screen shot while taking data

**Source:** (<http://bio-medical.com/products/used-emwave-desktop-for-pc-or-mac.html>, 2015)

## **Tools**

Two separate scripts for the two plays, “Dr. Faustus” and “Waiting for Godot”, were prepared. The study conducted at Taibah University Madinah Munawwarah, K.S.A. where all the students were native speakers of Arabic language. To get the results as accurate as possible, the experiment was conducted with three scripts of equal length and of the same contents but with different languages—Original text, Paraphrase and Arabic Translation. To synthesize the script, certain passages of Play 1 and Play 2 were selected to meet the challenges of the time limitation as it was impossible for the sample readers to read the whole text in one sitting. Each Paraphrase script was made of one thousand four hundred and seventy two words —1472--, enabling the participants to complete the reading within 12-14 minutes approximately. The number of words for Paraphrase scripts was maintained as the same, but they differ for the Original Text and Arabic Translation scripts. In one study (Ghiabi, 2014), the researcher gave an unabridged novel as an auxiliary material to the students of a class to investigate its effects but they were expected to complete it during the complete semester—sixteen weeks. To record the HRV of the readers, only a synthesized version of the text was needed which was prepared by the researcher.

## **Procedural Protocol**

### **Step 1: Relaxing 1**

One subject was to read the script silently at one time. When the actual data collection was started, they were asked to relax. That was Relaxing 1. For relaxing, they were asked to make Zikar or think about the happy moments in life or take slow breathing or just vacate their minds from all thoughts. The basic purpose of Relaxing 1 was to determine the Baseline values for VLF, HF and LF of the subjects so these values may be compared with the new values of the same variables after reading Script 1 and Script 2. Photoplethysmograph sensor was attached to one of the ear lobes of the subject. The Heart Rate Variability of the participant for Relaxing 1 was recorded in the emWave desktop software. The HRV for Relaxing 1 was recorded for 4 minutes. The participants were not reading anything except relaxing with the techniques they were instructed.

### **Step 2: Reading of Script 1 “Waiting for Godot”**

After 4 minutes of Relaxing 1, the participants were given Script 1 – the play “Waiting for Godot”—which they read silently. Their HRV was recorded. The objective for Script 1 Reading was to record the Heart Rate Variability of the subjects while they were reading the text which contained the ideas against their religious ideology. More specifically, the emotions of the Muslim readers were noted through their Psychophysiological changes using HRV Biofeedback while they were reading such a text which conveys the message that God does not exist.

### **Step 3: Relaxing 2**

After the completion of the reading of Script 1, the emWave software was stopped. The participants were requested to relax again for 3 minutes. That was Relaxing 2. The purpose of Relaxing 2 was to help normalize the emotional state of the subjects which was affected by Script 1 Reading. Moreover, Relaxing 2 values of HRV were needed to be compared with the

HRV values of Script 2 Reading to find the difference. After 3 minutes the readings of HRV were recorded for Relaxing 2 which lasted for 4 minutes.

#### **Step 4: Reading of Script 2 “Doctor Faustus”**

The Script 2 which was synthesized from the play “Dr.Faustus” was given to the participants. Their HRV was recorded for this session in the same way as it was taken for Script-1. The objective for Script 2 Reading was to record the Heart Rate Variability of the subjects while they were reading the text which contains the ideas that support their religious ideology. More specifically, the emotions of the Muslim readers were noted through their Psychophysiological changes using HRV Biofeedback while they were reading such a text which conveys the message that God does exist.

#### **Step 5: Relaxing 3**

After the silent reading for Script 2 was completed, the participants were requested to relax again for 3 minutes using the techniques they were explained about. The purpose of Relaxing 3 was to note down the normal values of HRV after reading Script 2. Some of the participants found making Zikar helpful to relax them, while others found thinking about the happy moments of life to relax them. Some of them even tried to use their social network websites on their smart phones as they argued that in this way they relax themselves. Slow breathing and imagining themselves that they are at beautiful place of their choice were also among the techniques adopted by the participants with good results. At the end, the last reading for Relaxing 3 was taken which also lasted for 4 minutes like Relaxing 1 and Relaxing 2 (Figure 3).

This procedure for data collection was repeated with the same protocol with the three groups of Original Text, Paraphrase and Arabic Translation. The whole process of data collection took almost one hour for one sample.

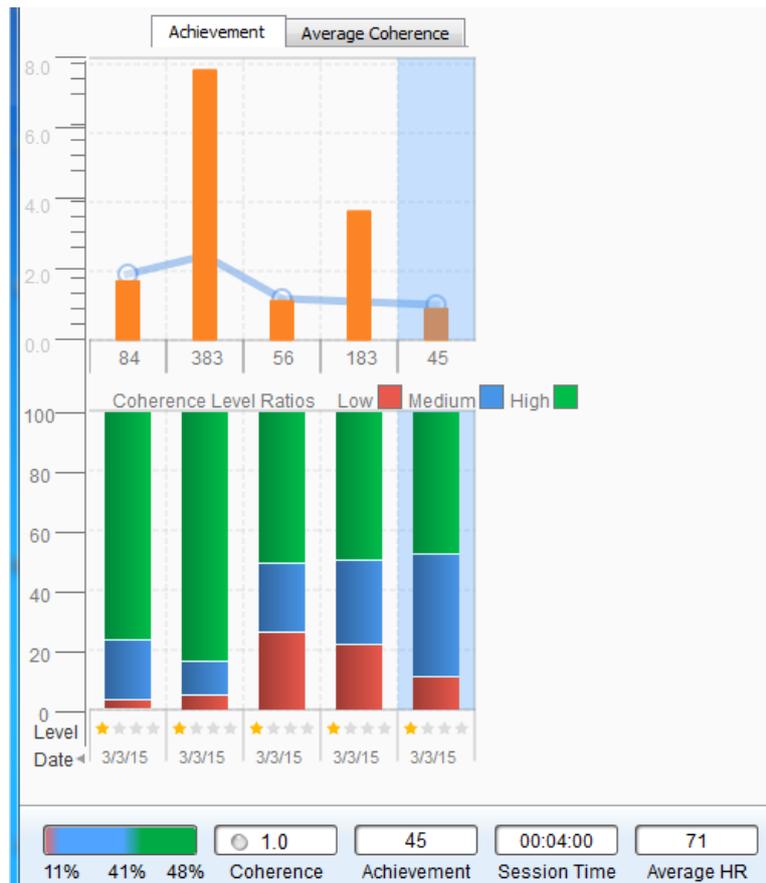
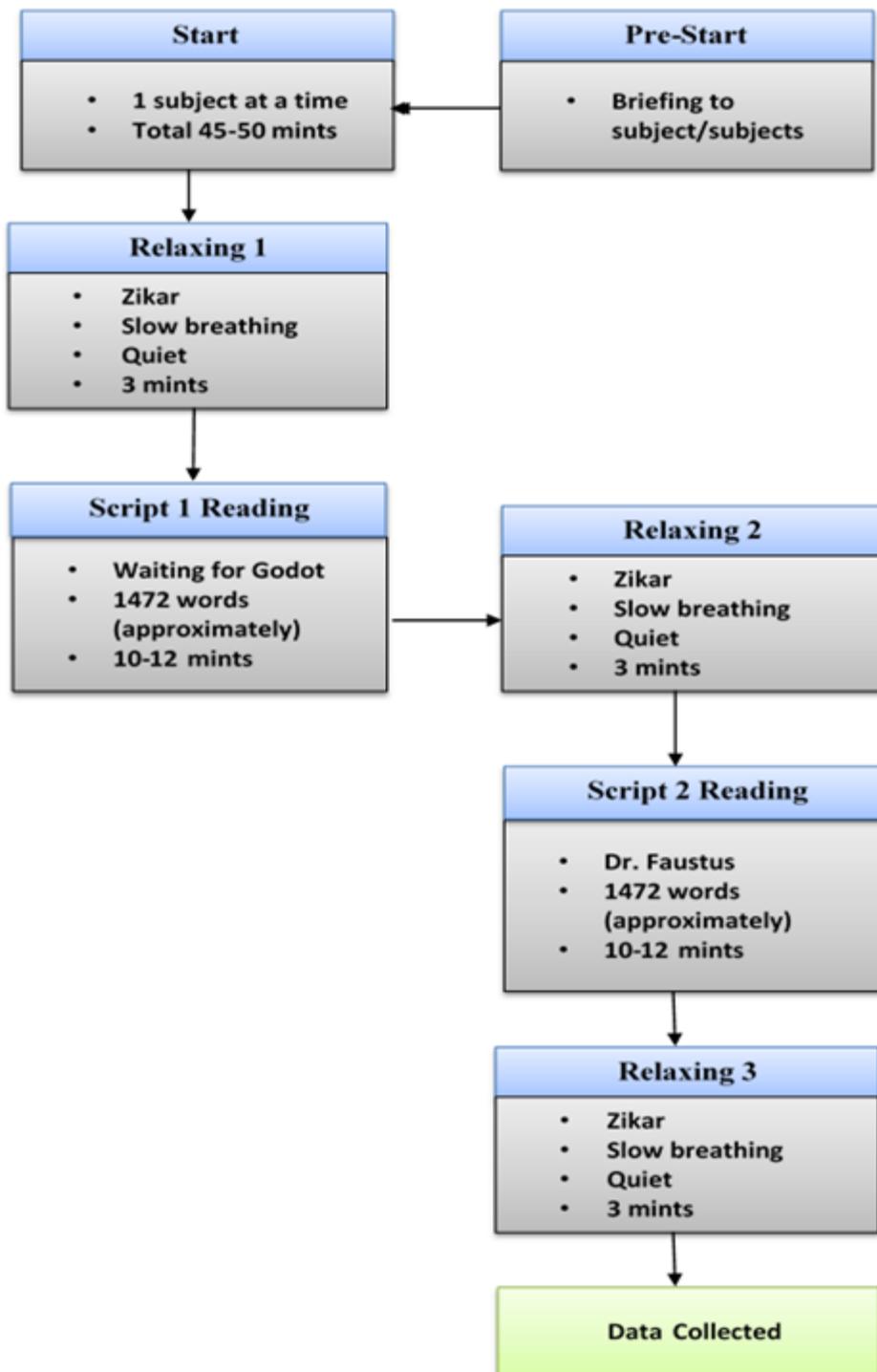


Figure 2: HRV record of the first sample

According to the procedure for data collection which is explained above, the first bar – from Right to Left-on the emWave desktop software- indicates the readings for Relaxing 1. The second bar indicates record for Script 1, the third for Relaxing 2, the fourth for Script 2 and last one the Left hand side for Relaxing 3 (Figure 2).The readings which were recorded by em-Wave desktop software included Heart Rate Variability which are further classified as Average Heart Rate (AHR), Very Low Frequency (VLF), High Frequency (HF) and Low Frequency (LF). VLF is represented on the software by Red color, HF by Blue and LF by Green. EmWave desktop software also recorded the session’s duration for Relaxing 1, 2, 3 and Script 1, 2.

**Design and Data Analysis**

The data was entered and analyzed using SPSS 22.0. Mean + S.D was given for quantitative variables. Frequencies and percentages were given for qualitative variables.



**Figure 3:** Methodology flow chart for the objective of the study.

**RESULTS****Coherence Score for Script 1 and Script 2**

The overall minimum coherence score of the students while reading Script 1 was .20 and the overall maximum coherence score of the students while reading script 1 was 1.40. Mean value was  $.70 \pm .24$ . The minimum coherence score of the students while reading Script 2 was 1.40 and the maximum coherence score of the students while reading script 2 was 2.40. Mean value was  $.79 \pm .33$  (Table 2).

**Group 1 (Original Text):**

The minimum coherence score of the students while reading Script 1 was .30 and the maximum coherence score of the students while reading script 1 was 1.10. Mean value was  $.67 \pm .22$ . The minimum coherence score of the students while reading Script 2 was .40 and the maximum coherence score of the students while reading script 2 was 2.40. Mean value was  $.75 \pm .41$ .

**Group 2 (Paraphrase):**

The minimum coherence score of the students while reading Script 1 was .30 and the maximum coherence score of the students while reading script 1 was 1.40. Mean value was  $.84 \pm .24$ . The minimum coherence score of the students while reading Script 2 was .40 and the maximum coherence score of the students while reading script 2 was 1.40. Mean value was  $.86 \pm .27$ .

**Group 3 (Arabic Translation):**

The minimum coherence score of the students while reading Script 1 was .20 and the maximum coherence score of the students while reading script 1 was .90. Mean value was  $.59 \pm .21$ . The minimum coherence score of the students while reading Script 2 was .40 and the maximum coherence score of the students while reading script 2 was 1.50. Mean value was  $.77 \pm .31$ .

**Table 4. 5: Results of coherence score****Table 2: Results of coherence score**

Variables	Number	Minimum	Maximum
<b>Script 1</b>			
Total=	66	.20	1.40
Original Text=	22	.30	1.10
Paraphrase= Arabic	22	.30	1.40
Translation=	22	.20	.90
<b>Script 2</b>			
Total=	66	.40	2.40
Original Text=	22	.40	2.40
Paraphrase=Arabic	22	.40	1.40
Translation=	22	.40	1.50

**Achievement Score for Script 1 and Script 2**

The overall minimum achievement score of the students while reading Script 1 was 19.00, the overall maximum achievement score of the students while reading script 1 was 218.00. Mean value was  $90.51 \pm 45.79$ . The minimum achievement score of the students while reading Script 2 was 32.00 and the maximum achievement score of the students while reading script 2 was 383.00. Mean value was  $96.83 \pm 62.01$ .

**Group 1 (Original Text):**

The minimum achievement score of the students while reading Script 1 was 31.00 and the maximum achievement score of the students while reading script 1 was 183. Mean value was  $81.81 \pm 34.17$ . The minimum achievement score of the students while reading Script 2 was 35.00 and the maximum achievement score of the students while reading script 2 was 383.00. Mean value was  $94.45 \pm 72.72$ .

**Group 2 (Paraphrase):**

The minimum achievement score of the students while reading Script 1 was 56.00 and the maximum achievement score of the students while reading script 1 was 218. Mean value was  $124.95 \pm 49.55$ . The minimum achievement score of the students while reading Script 2 was 62.00 and the maximum achievement score of the students while reading script 2 was 241.00. Mean value was  $131.31 \pm 56.55$ .

**Group 3 (Arabic Translation):**

The minimum achievement score of the students while reading Script 1 was 19.00 and the maximum achievement score of the students while reading script 1 was 137. Mean value was  $64.77 \pm 29.19$ . The minimum achievement score of the students while reading Script 2 was 32.00 and the maximum achievement score of the students while reading script 2 was 157.00. Mean value was  $64.72 \pm 32.92$ .

**Very Low Frequency (VLF)**

The overall minimum percentile of VLF component of HRV of the students while reading Script 1 was 21 and the overall maximum percentile of VLF component of HRV of the students while reading script 1 was 95. Mean value was  $60.74 \pm 18.46$ . The minimum percentile of VLF component of HRV of the students while reading Script 2 was 6 and the maximum percentile of VLF component of HRV of the students while reading script 2 was 92. Mean value was  $58.23 \pm 17.97$ .

**Group 1 (Original Text):**

The minimum percentile of VLF component of HRV of the students while reading Script 1 was 35 and the maximum percentile of VLF component of HRV of the students while reading script 1 was 95. Mean value was  $61.73 \pm 17.58$ . The minimum percentile of VLF component of HRV of the students while reading Script 2 was 6 and the maximum percentile of VLF component of HRV of the students while reading script 2 was 92. Mean value was  $61.27 \pm 19.62$ .

**Group 2 (Paraphrase):**

The minimum percentile of VLF component of HRV of the students while reading Script 1 was 21 and the maximum percentile of VLF component of HRV of the students while reading script 1 was 87. Mean value was  $53.91 \pm 16.25$ . The minimum percentile of VLF component of HRV of the students while reading Script 2 was 19 and the maximum percentile of VLF component of HRV of the students while reading script 2 was 86. Mean value was  $53.18 \pm 17.80$ .

### **Group 3 (Arabic Translation):**

The minimum percentile of VLF component of HRV of the students while reading Script 1 was 37 and the maximum percentile of VLF component of HRV of the students while reading script 1 was 94. Mean value was  $66.59 \pm 19.89$ . The minimum percentile of VLF component of HRV of the students while reading Script 2 was 22, the maximum percentile of VLF component of HRV of the students while reading script 2 was 88. Mean value was  $60.23 \pm 16.35$ .

### **High Frequency (HF)**

The overall minimum percentile of HF component of HRV of the students while reading Script 1 was 4 and the overall maximum percentile of HF component of HRV of the students while reading script 1 was 39. Mean value was  $21.35 \pm 8.18$ . The minimum percentile of HF component of HRV of the students while reading Script 2 was 7 and the maximum percentile of HF component of HRV of the students while reading script 2 was 45. Mean value was  $20.62 \pm 7.64$ .

### **Group 1(Original Text):**

The minimum percentile of HF component of HRV of the students while reading Script 1 was 4 and the maximum percentile of HF component of HRV of the students while reading script 1 was 39. Mean value was  $23.00 \pm 8.61$ . The minimum percentile of HF component of HRV of the students while reading Script 2 was 7 and the maximum percentile of HF component of HRV of the students while reading script 2 was 34. Mean value was  $19.41 \pm 6.65$ .

### **Group 2 (Paraphrase):**

The minimum percentile of HF component of HRV of the students while reading Script 1 was 9 and the maximum percentile of HF component of HRV of the students while reading script 1 was 32. Mean value was  $21.14 \pm 6.00$ . The minimum percentile of HF component of HRV of the students while reading Script 2 was 9 and the maximum percentile of HF component of HRV of the students while reading script 2 was 34. Mean value was  $21.64 \pm 6.87$ .

### **Group 3 (Arabic Translation):**

The minimum percentile of HF component of HRV of the students while reading Script 1 was 5 and the maximum percentile of HF component of HRV of the students while reading script 1 was 38. Mean value was  $19.91 \pm 9.59$ . The minimum percentile of HF component of HRV of the students while reading Script 2 was 9 and the maximum percentile of HF component of HRV of the students while reading script 2 was 45. Mean value was  $20.82 \pm 9.30$ .

### **Low Frequency (LF)**

The overall minimum percentile of LF component of HRV of the students while reading Script 1 was 0 and the overall maximum percentile of LF component of HRV of the students while reading script 1 was 60. Mean value was  $17.97 \pm 14.05$ . The minimum percentile of LF

component of HRV of the students while reading Script 2 was 0 and the maximum percentile of LF component of HRV of the students while reading script 2 was 84. Mean value was  $21.11 \pm 15.88$ .

### Group 1 (Original Text):

The minimum percentile of LF component of HRV of the students while reading Script 1 was 1 and the maximum percentile of LF component of HRV of the students while reading script 1 was 36. Mean value was  $15.27 \pm 11.57$ . The minimum percentile of LF component of HRV of the students while reading Script 2 was 1 and the maximum percentile of LF component of HRV of the students while reading script 2 was 84. Mean value was  $19.18 \pm 18.04$ .

### Group 2 (Paraphrase):

The minimum percentile of LF component of HRV of the students while reading Script 1 was 1 and the maximum percentile of LF component of HRV of the students while reading script 1 was 60. Mean value was  $24.95 \pm 15.09$ . The minimum percentile of LF component of HRV of the students while reading Script 2 was 3 and the maximum percentile of LF component of HRV of the students while reading script 2 was 58. Mean value was  $25.18 \pm 14.22$ .

### Group 3 (Arabic Translation):

The minimum percentile of LF component of HRV of the students while reading Script 1 was 0 and the maximum percentile of LF component of HRV of the students while reading script 1 was 39. Mean value was  $13.68 \pm 13.08$ . The minimum percentile of LF component of HRV of the students while reading Script 2 was 0 and the maximum percentile of LF component of HRV of the students while reading script 2 was 61. Mean value was  $18.95 \pm 15.07$ .

**Table 3: Results of HRV**

Variables	Number	Minimum	Maximum
Script 1 VLF			
Total	66	21	95
Original Text	22	35	95
Paraphrase	22	21	87
Arabic Translation	22	37	94
Script 1 HF			
Total	66	4	39
Original Text	22	4	39
Paraphrase	22	9	32
Arabic Translation	22	5	38
Script 1 LF			
Total	66	0	60
Original Text	22	1	36
Paraphrase	22	1	60
Arabic Translation	22	0	39
Script 1 LF/HF Ratio			
Total	66	.00	3.44
Original Text	22	.10	1.78

Paraphrase Arabic Translation	22	.08	3.44
	22	.00	1.59
Script 2 VLF			
Total	66	6	92
Original Text	22	6	92
Paraphrase Arabic Translation	22	19	86
	22	22	88
Script 2 HF			
Total	66	7	45
Original Text	22	7	34
Paraphrase Arabic Translation	22	9	34
	22	9	45
Script 2 LF			
Total	66	0	84
Original Text	22	1	84
Paraphrase Arabic Translation	22	3	58
	22	0	61
Script2LF/HF Ratio			
Total	66	.00	8.40
Original Text	22	.12	8.40
Paraphrase Arabic Translation	22	.23	2.60
	22	.00	3.73

### LF/HF Ratio

The overall minimum LF/HF ratio of the students while reading Script 1 was .00, the overall maximum LF/HF ratio of HRV of the students while reading script 1 was 3.44. Mean value was  $.84 \pm .75$ . The minimum LF/HF ratio of HRV of the students while reading Script 2 was .00, the maximum LF/HF ratio of HRV of the students while reading script 2 was 8.40. Mean value was  $1.15 \pm 1.23$ .

### Group 1 (Original Text):

The minimum LF/HF ratio of the students while reading Script 1 was .10, the maximum LF/HF ratio of HRV of the students while reading script 1 was 1.78. Mean value was  $.62 \pm .46$ . The minimum LF/HF ratio of HRV of the students while reading Script 2 was .12, the maximum LF/HF ratio of HRV of the students while reading script 2 was 8.40. Mean value was  $1.12 \pm 1.69$ .

### Group 2 (Paraphrase):

The minimum LF/HF ratio of the students while reading Script 1 was .08, the maximum LF/HF ratio of HRV of the students while reading script 1 was 3.44. Mean value was  $1.29 \pm .95$ . The minimum LF/HF ratio of HRV of the students while reading Script 2 was .23, the maximum LF/HF ratio of HRV of the students while reading script 2 was 2.60. Mean value was  $1.19 \pm .71$ .

**Group 3 (Arabic Translation):**

The minimum LF/HF ratio of the students while reading Script 1 was .00, the maximum LF/HF ratio of HRV of the students while reading script 1 was 1.59. Mean value was  $.60 \pm .54$ . The minimum LF/HF ratio of HRV of the students while reading Script 2 was .00, the maximum LF/HF ratio of HRV of the students while reading script 2 was 3.73. Mean value was  $1.15 \pm 1.14$ .

**DISCUSSION**

The objective of the study was to determine the impact of “Dr. Faustus” and “Waiting for Godot” towards HRV of the readers.

The results of HRV of the readers of these plays are quite different for both the plays (Table 3); showing a similar tendency among all the groups (Overall, Intra Group and Inter Group in Original Text, Paraphrase and Arabic Translation Group). For Script 1-“Waiting for Godot”- the VLF increases while the Coherence, Achievement, HF, LF, LF/HF Ratio decrease. On the other hand, for Script 2-“Dr. Faustus”- the Coherence, Achievement, HF, LF, LF/HF Ratio increase and the VLF decreases. The only exception is LF/HF Ratio for Paraphrase group. These results reveal that the students felt stressed while they were reading “Waiting for Godot” which conveys a skeptic message so far as the existence of is God is concerned. On the other hand, the students were relaxed as they read “Dr. Faustus” which carries the affirmative message regarding the existence of God. This interpretation of the Muslim students of the two plays is supported by the literary theory “Interpretive Communities” by Stanley Fish.

**CONCLUSION**

From the above results and discussion, the link between Literature and Emotions is empirically proved using HRV Biofeedback for the first time. The comparative impact of the two plays with the opposite themes and the opposite HRV results reinforce this empirical study.

**Recommendation for Future Research**

The link between reading literature and emotions has been established empirically in this study using HRV Biofeedback. Thus, HRV Biofeedback may be used in future linguistic/literary studies. It may especially be used in measuring emotions of the readers. The present study measures the emotions of the readers of English Literature, Future studies may measure the emotions in “Listening”, “Speaking” and “Writing”. Different methods may be manipulated to assess the difficulties in all the skills of language using HRV Biofeedback. This study uses two plays “Waiting for Godot” and “Dr. Faustus” as tools to determine the comparative impact of these plays on the readers’ emotions. HRV Biofeedback may also be used in other genres of literature especially Poetry, Novel and Short Story to determine the impact of literature on readers’ emotions. Besides measuring the emotions of the readers of the two plays through HRV, this study proves the link between literature and emotions. Further research may be continued with the other genres of literature to establish the link between literature and emotions.

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