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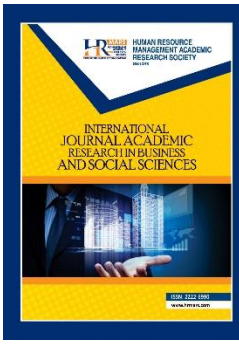
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Effects of Quran Recitation on Heart Rate Variability as an indicator of Student Emotions

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Abstract: This study examined the effects of Quran recitation on the Heart Rate Variability (HRV) of students. By doing so, this research extends previous findings on the effects of religious activities on university students. This research therefore studies the relationship between HRV with different Quran recitation types with different reading styles (Tajweed), Surah (stories) and themes (i.e. heaven, hell and punishment). The experiment comprises four sessions that each lasted approximately 30 minutes and that involved the recitation of certain Quran Surah or verses. At the end of each session, the difference between pre- and post-session HRVs was derived. The results of this research may be used to help university students reduce stress, tension and anxiety.

Introduction

The fact that the Quran contains literary gems in every Ayah, passage and Sarah is one proof of its exceptionality. The Quran surpassed the high level of classical Arabic eloquence and even has its own style, layout and features. Furthermore, the Quran has a uniquely powerful message that inspires men to change their whole lifestyle by wholly guiding them (Nakhavali & Seyedi, 2013). As a divine guidance message for humans, the Quran involves all material and spiritual aspects of life and provides all that is needed to guide and educate humans socially, individually and morally in this life and in preparation for the next (Azarpour, Moraditochaeeb, & Bozorgia, 2014).

The Quran is a masterpiece, and it sets its own standards and unique style that is inimitable and astounding when viewed from the literary perspective. The Quran also addresses all human beings and uses a clear and comprehensible language that attracts every reader or listener (Nakhavali & Seyedi, 2013).

The recitation of the Holy Quran is governed by a variety of rules called the 'Tajweed Rules', which prescribe the correct pronunciation of the Holy Quran. Reciting the Holy Quran in the

appropriate manner is important to all Muslims and is indispensable in Islamic worship, such as in prayer.

Therefore, since its revelation to the prophet, the correct recitation of the Quran was transmitted orally across generations. Oral transmission was considered the only way to learn the correct recitation of the Quran until the 20th century, when technology produced systems and electronic devices that are capable of recording the text and correct recitation of the Quran with Tajweed Rules. Since then, listening to Quran recitations recorded from authentic reciters has become possible (Abdullah & Omar, 2011).

(Abdullah & Omar, 2011) reported that Quran recitation produces a significant calming effect that releases hormones and chemicals responsible for relaxation (Shekha, Hassan, & Othman, 2013).

Many factors that are internal and external to the human body affect HRV and breathing behaviour (Al-Zaben, Hamad, Alfahoum, & Saefan, 2014). Emotions are an irrepressible and uncontrollable aspect of the human mental state. In fact, some bad situations induce stress and lead to different hardships. Although one cannot always avoid such situations, he or she can be aware of when the body feels stress or any other strong emotion (Sharma & Kapoor, 2014).

Several studies have focused on the effect of music on emotion and health. Examples include the effect of music on health (Safara & Samanesadatsadidpoor, 2014), the emotions and the learning improvement of children (Foran, 2009), student performance (Horton, Bustamante, Edmonson, & Slate, 2011), students diagnosed with emotional and behavioural disorders (Ryan Douglas Detty, 2013), stress test anxiety and test grades among high school students (Rastogi & Silver, 2014) and on stress and anxiety in general (Gautam, Goswami, Jain, Mondol, & Gandhi, 2015).

Some researchers also studied the effects of music on the human body or on the brain which is one of the most complex organic systems as it involves billions of interacting physiological and chemical processes that may be experimentally observed through an electroencephalogram (EEG). Many researchers have investigated the effect of various proceedings, such as meditation and classical music, on EEG signals (Bhattacharya & Petsche, 2001; Nakamura, Sadato, Oohashi, Nishina, & Yonekura, 1999). From the results of these studies, the researchers claimed that meditation and classical music help a person relax.

PROBLEM STATEMENT

The movement and stress management of college students directly affect their health behaviours. Stress occurs when persons view a situation, demand or challenge as exceeding their available coping resources. In fact, university students are vulnerable to several stress factors, including academic and social pressures and new environments.

The adverse medical consequences of chronic stress and tension are widely known and are amply documented. Such consequences include an increased incidence of many chronic medical illnesses resulting in guarded prognoses in cases compounded by on-going and un-relieved stressful life conditions. The reduction of inner and outer stress is therefore a fundamental and paramount element of basic self-care, which not only lessens the unpleasant subjective consequences of neglected or mishandled stress but also improves the basic tone and physiological health of a person.

Finding strategies to improve student emotion, stress and tension is also considerably important. One of the promising psychophysiology training strategies uses HRV feedback. The HRV represents beat-to-beat changes in inter-beat intervals. Beat-to-beat variability is affected by ANS activity. In fact, scientists accept that interactions in the heart generally reflect ANS balance or imbalance in the body (BERNTSON et al., 1997). Optimum variability in heart rate is crucial because diminished HRV indicates susceptibility to physical and psychological stressors and diseases (Lehrer, 2007). By contrast, a high HRV has been linked with creativity, psychological resilience and a developed capacity to control the affective, cognitive and physiological effects of stress (Appelhans & Luecken, 2006; Hansen, Johnsen, & Thayer, 2003). The HRV biofeedback also shows the potential to be an effective tool for improving resilience to stress and the emotional well-being of healthy subjects (Barrios-Choplin, McCraty, & Cryer, 1997). Therefore, the present study aims to assess whether HRV biofeedback can reduce negative emotional symptoms of the operator, particularly in terms of depression, anxiety and stress.

Listening to Holy Quran recitation is a highly recognised form of Islamic repentance among the Muslim community. Undoubtedly, these beliefs enable the mind and soul of a person to flourish. Therefore, this form of repentance has the power to reduce the anxiety and stress of a person, such as those manifesting in psychological, pessimistic matters. Listening to Holy Quran recitation can also relieve and calm a disturbed mind and may thus be used as a therapeutic agent in some cases (Salam, Wahab, & Ibrahim, 2013).

Many existing studies on university level student stress and coping have concentrated on describing stressors or coping strategies and on further defining a conceptual model of stress and coping (Ryan-Wenger, Sharrer, & Campbell, 2005).

Muslims practice reciting al-Quran and believe it to be a way to alleviate stress and recover from sickness. Therefore, this study examined the effects of Quran recitation on HRV and breath behaviours as indicators of student emotions (Heidari, Shahbazi, & Bahrami, 2014), thereby extending research findings on the effects of religious activities on university students. Specifically, the capability of Quran recitation and praying to Allah to reduce test anxiety was examined. Policy-makers and managers may use the results of this research in addressing the need to reduce stress and tension in relation to exams.

Methodology

In the preliminary study, the effects of Quran recitation on the HRV of one student were evaluated. The student underwent four sessions lasting approximately 30 minutes each including rest time between parts, in which he as a reader recites certain surah or verses from the Quran. The all sessions comprised three parts lasting approximately 5 minutes each. In all sessions, the baseline coherence ratio and accumulate coherence were measured within the 2-3 minutes, before reading started.

During the first session, the reader focused on Tajweed. The first part was about *Ma'ad*, from Al-Ma'ida *Surah* (13–40). The second part was about *Waqf*, from Al-Ma'ida *surah* (51–87). The last part was about *Ma'ad*, *Waqf* and other types of Tajweed verses from An-nur *Surah* (21–41).

During the second session, the reader focused on a certain story for each part. The first part featured the story from Al-Baqarah *Surah* (47–66) about the prophet Musa and his people who

were the Jews. The second part featured the story from Al-Kahf *Surah* (60–82) about the prophet Musa and the pietistic man, Al Kuder. The last part featured the story from Yusuf *Surah* (1–21) about the prophet Yusuf and his brothers.

The third session features certain verses about heaven, hell and the punishment given to those who do not believe in the prophets. The first part featured certain verses about heaven from Ar-Rahman *Surah* (29–78) and Al Waqiah *Surah* (10–40). The second part featured certain verses about hell from Al-Mursalat *Surah* (1–50). The last part featured verses about the previously mentioned punishment from Hud *Surah* (50–83).

Finally, the fourth session is about understanding the meaning of the given Quran verse. During the first part, the reader recited the original Al-Kahf *Surah* (1–20) verses without understanding what they mean as they were in a different language. Then, during the second part, the reader recited the same verses but after he read the translated Quran verses. The third part about reading from newspaper.

RESEARCH DESIGN

Repeat measuring within the subject research design was incorporated using a mixed-methodology approach. The goal of this study is to examine pre- and post-session HRVs of each session to identify the change of emotions during Quran recitation. This study employed a combination of convenience selection and random assignment sampling methods. In this study, the researcher chose certain *Surah* and verses from the Quran and focused on Tajweed, stories in some *Surahs* and themes (e.g. heaven and hell) and undestanding. Figure 1 represent this research design.

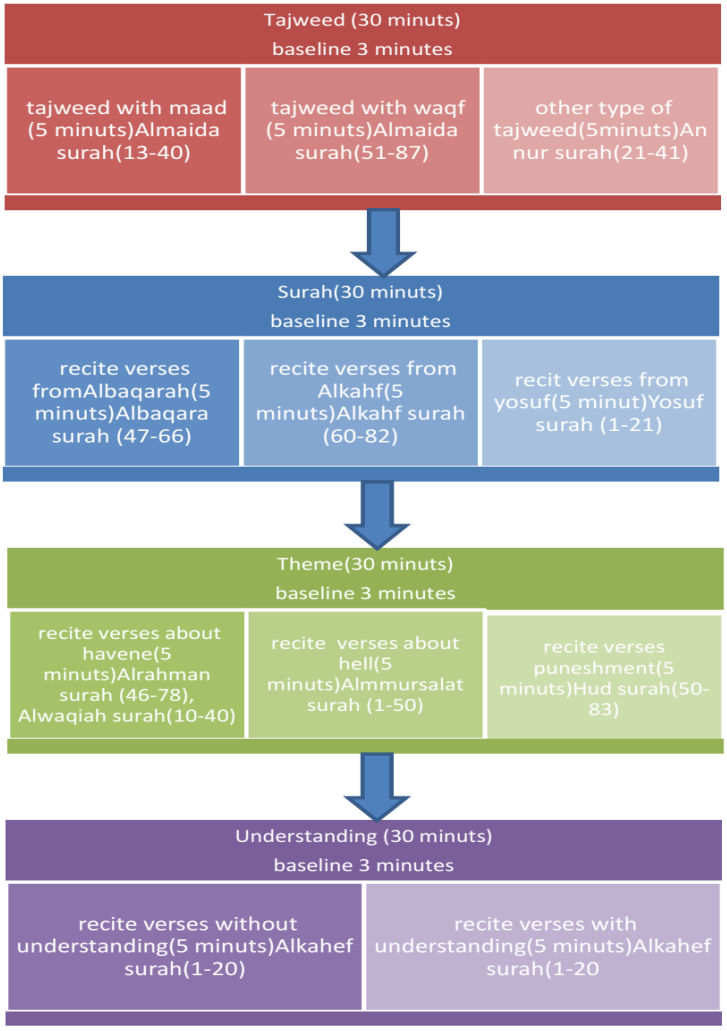

Figure 1 RESEARCH DESIGN

HRV Biofeedback Instrument

The emWave tool and the emWave PC biofeedback (1.0) software developed by the HeartMath Institute for heart-rhythm variations were used in HRV data collection. According to (Reyes, 2014), the emWave is a portable device that helps individuals monitor HRV and rehearse biofeedback techniques. In the present study, the HRV data were separately collected from the volunteer participants under a particular session protocol. The emWave device is capable of measuring the pulse of an individual by placing the sensor of the tool on his or her ear and of detecting HRV patterns of spaces between heartbeats (Ross, 2011). According to (Ross, 2011), use of the emWave for HRV assessment under the HeartMath Institute process is unquestionable and quantitatively effective. Through various studies, the HeartMath Institute has provided evidence demonstrating the effective role of healthy hearts on the well-being and balanced lives of individuals. The emWave tool and other kinds of biofeedback technology of the HeartMath Institute are valid based on various academic studies on biofeedback, stress and emotions that were conducted in the last 17 years (HeratMath, 2016).

Researchers and scholars (McCraty & Shaffer, 2015; Reyes, 2014; Ross, 2011; Sarwari & Abdul Wahab, 2017) have used various types of HRV biofeedback technology, including the emWave device and software, in their studies on different fields and various perspectives, such as health, psychology, education, sports and the military. Results from their studies confirmed the effectiveness of the use of emWave and other types of biofeedback technology on human performance, enabling individuals to assess the movement and reactions of their heart. Figures 2 and 3 show the emWave PC tool and its ear sensor, respectively, the pictures used in which were taken from the official page of the (HeratMath, 2016).

Figure 2 emWave PC tool

Figure 3 ear sensor for emWave PC tool

PROCEDURES

In this study, the effects of Quran recitation on HRV undergraduate student were evaluated. The student were recruited from the University Malaysia Pahang, before the HRV biofeedback data collection sessions, the letter of consent that included information about the data collection procedure, schedule and the sessions was given to the volunteer participant to ensure careful consideration. Figure 4 illustrates the study procedure.

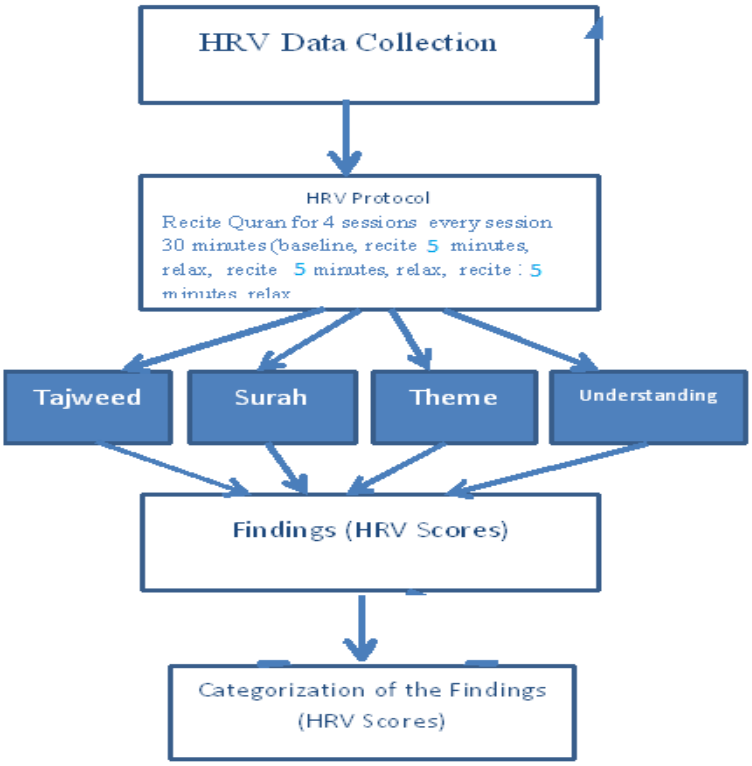

Figure 4 HRV Data Collection

Results

Figure 5 presents the test results of student, showing increased coherence, that is, from 0 to 93, after more than five minutes of Quran recitation. All parts of the four sessions recorded a very low baseline coherence rate which started to continuously increase once reading commenced.

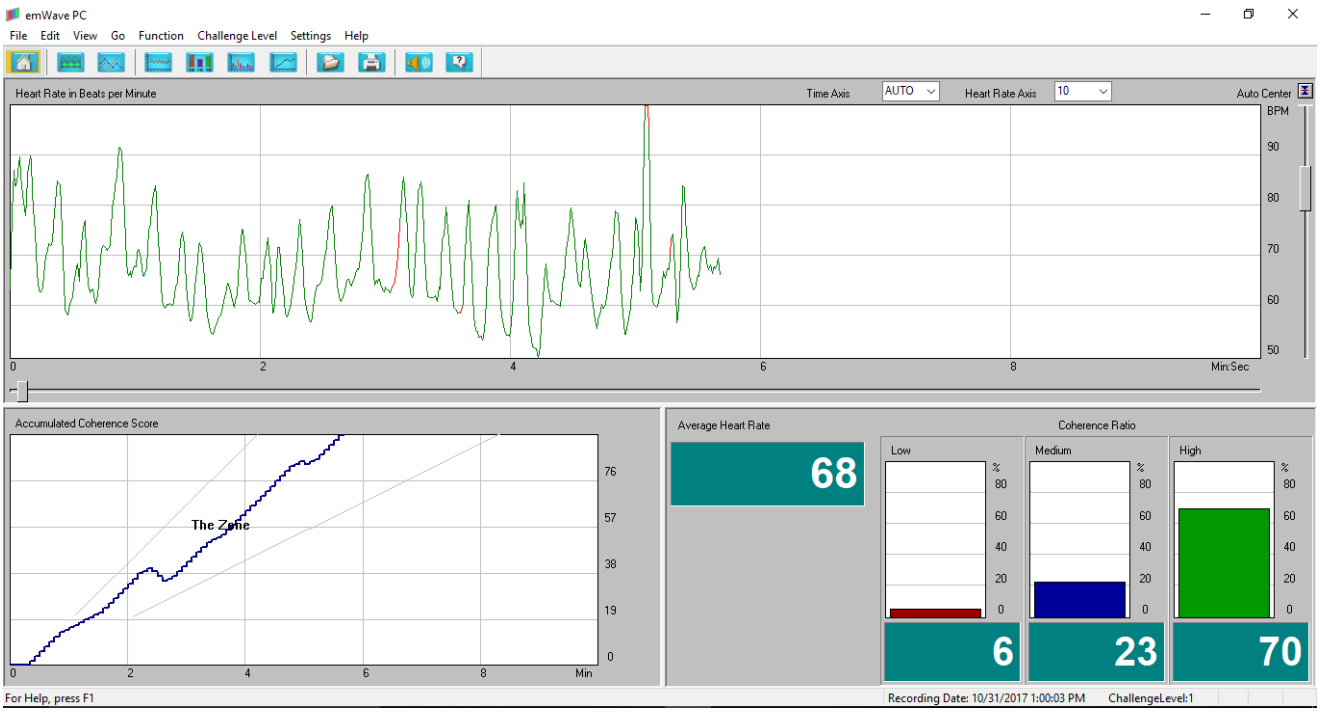

Figure 5 Test results of emWave.

In the first session (Table 1), the first part yielded a coherence rate of 70, an average heart rate of 83, and a HRV power spectrum of 0.11 Hz. By the end of the second part, coherence rate was 54, average heart rate was 85 and HRV power spectrum was 0.08 Hz. Finally, by the end of the last part, coherence rate was 66, average heart rate was 83 and HRV power spectrum was 0.09 Hz. These results have been illustrated in Figure 6 and Figure 7.

Table 1 Results of session 1 (Tajweed).

Tajweed	Baseline	Coherence rate	Average heart rate	HRV power spectrum
Ma'ad: Al-Ma'ida *surah* (13–40)	Low coherence	70	83	0.11 Hz
Waqf: Al-Ma'ida *surah* (51–87)	Low coherence	54	85	0.08 Hz
Other types of tajweed: An-nur *surah* (21–41)	Low coherence	66	83	0.09 Hz

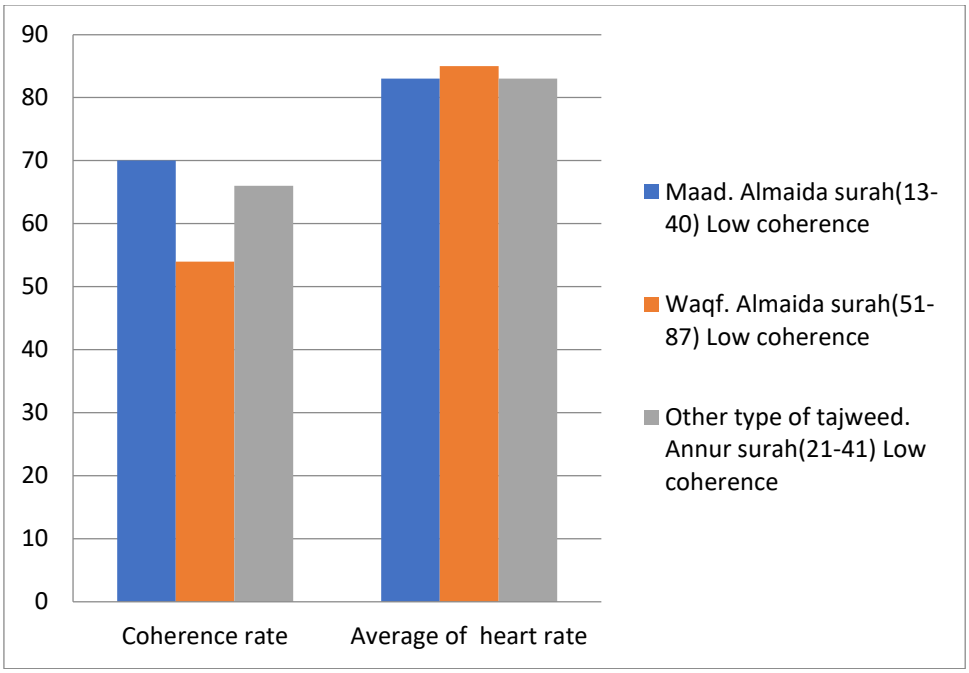

Figure 6 Tajweed session coherence rate and average of heart rate results.

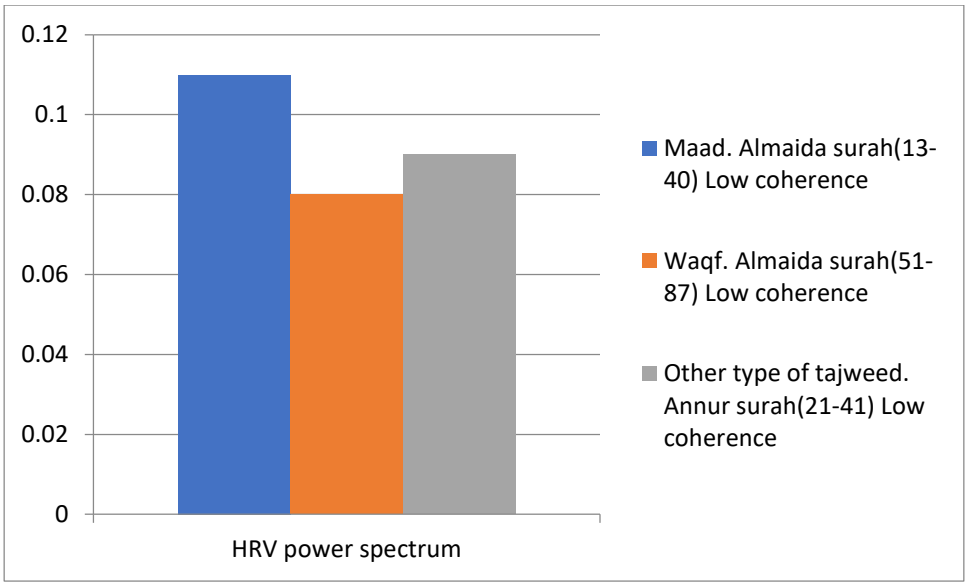

Figure 7 Tajweed session HRV power spectrum results.

In the second session (Table 2), the first part yielded a coherence rate of 85, an average heart rate of 84 and a HRV power spectrum of 0.09Hz. By the end of the second part, coherence rate was 65, average heart rate was 93 and HRV power spectrum was 0.10Hz. Finally, by the end of the last part, coherence rate was 64, average heart rate was 89 and HRV power spectrum was 0.12 Hz. These results have been presented in Figure 8 and Figure 9.

Table 2 Results of session 2 (Sursh).

Surah	Baseline	Coherence rate	Average heart rate	HRV power spectrum
Al-Baqarah. Al-Baqarah surah (47–66)	Low coherence	85	84	0.09 Hz
Al-Kahf. Al-Kahf surah (60–82)	Low coherence	65	93	0.10 Hz
Yusuf. Yusuf surah (1–21)	Low coherence	64	89	0.12 Hz

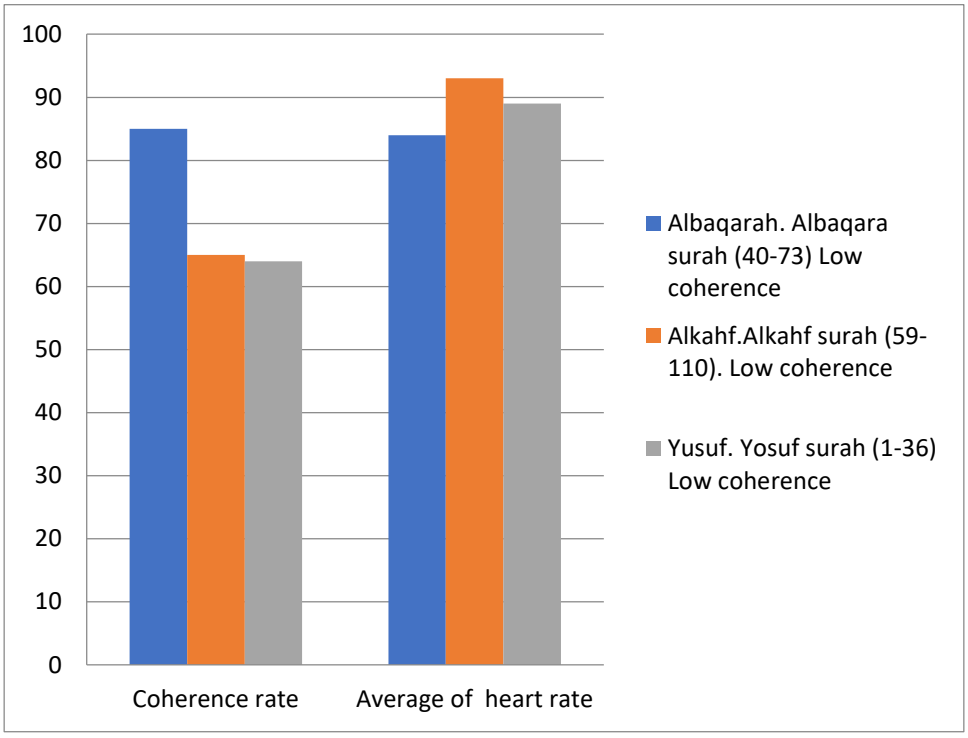

Figure 8 Sursh session coherence rate and average of heart rate results.

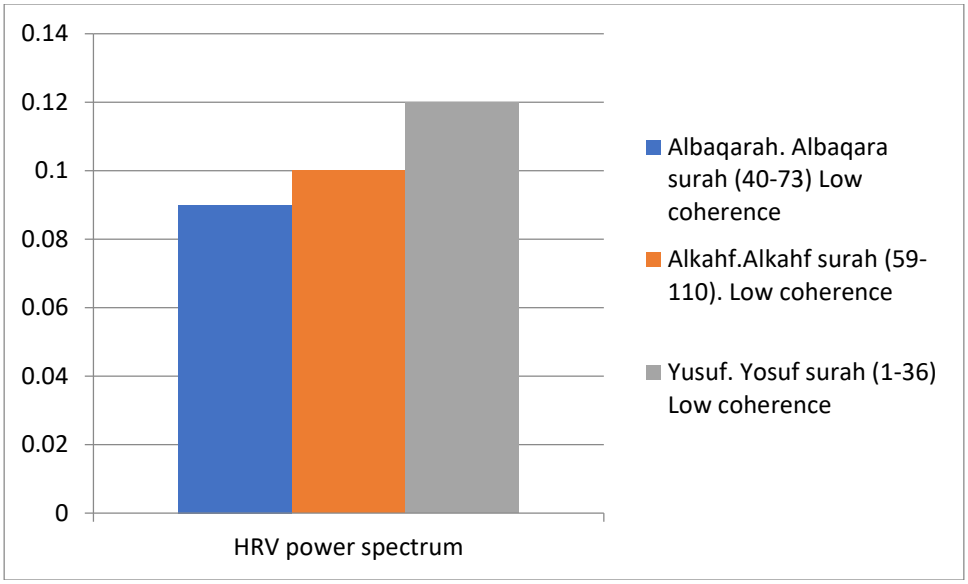

Figure 9 Sursh session HRV power spectrum results.

In the third session (Table 3), the first part yielded a coherence rate of 89, an average heart rate of 80 and a HRV power spectrum of 0.09 Hz. By the end of the second part, coherence rate was 65, average heart rate was 80 and HRV power spectrum was 0.13Hz. Finally, by the end of the last part, coherence rate was 70, average heart rate was 81 and HRV power spectrum was 0.09 Hz.

Table 3 Results of session 3 (Theme).

Theme	*surah*	Baseline	Coherence rate	Average heart rate	HRV power spectrum
Heaven	Ar-Rahman *surah* (46-78),	Low coherence	89	80	0,09 Hz
	Al Waqiah *surah* (10-40)	Low coherence	66	76	0.13 Hz
Hell	Al-Mursalat *surah* (1-50)	Low coherence	65	80	0.13 Hz
Punishment	Hud *surah* (50-83)	Low coherence	70	81	0.09 Hz

In the fourth session (Table 4), the first part yielded a coherence rate of 55, an average heart rate of 90 and a HRV power spectrum of 0.09Hz. By the end of the second part, coherence rate was 77, average heart rate was 82 and HRV power spectrum was 0.12 Hz. Finally, by the end of the last part, reading newspaper, coherence rate was 36, average heart rate was 77 and HRV power spectrum was 0.07 Hz, which represent lower relaxation than Quran reading.

Table 4 Results of session 4 (Understanding).

Al-Kahf surah (1–44)	Baseline	Coherence rate	Average heart rate	HRV power spectrum
before translation	Low coherence	55	90	0.09
after translation	Low coherence	77	82	0.12
Reading Newspaper	Low coherence	36	77	0.07

Conclusion

The current research aims to determine the relationship between HRV with different types of Quran recitation with various reading styles. The experiment comprises four sessions which all exhibited a similar trend. Although the baseline coherence rate in all four sessions was low, the rate started continuously increasing once reading commenced. For the first session which focused on Tajweed, coherence rate increased to 54, average heart rate was 85 and HRV power spectrum was 0.08 Hz. During the second session which focused on story, coherence rate increased to 85, average heart rate was 84 and HRV power spectrum was 0.09 Hz. During the third session which focused on certain verses about heaven, hell and punishment, coherence rate increased to 70, average heart rate was 81 and HRV power spectrum was 0.09 Hz. During the fourth session which was about understanding the meaning of the given Quran verse, coherence rate increased to 77, average heart rate was 82 and HRV power spectrum was 0.12 Hz.

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