

# Listening to the Quran Recitations: 'Does It Affect Psychophysiological Measures of Emotion?'

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**Abstract.** This study was designed to examine the effect of listening to the Quran recitations based on different melodies on the psychophysiological measurements of emotion. The skin conductance and heart rate were measured as the physiological response; meanwhile, the mood and emotion scale were analysed as participant's psychological assessment. The experiment was conducted with 22 Indonesian postgraduate students studying from various programs who are Muslims. An individual experiment was carried out in the listening laboratory of the Music Department, The University of York. Four different recitations were delivered. Shimmer GSR unit was used to measure the skin conductance and heart rate. Positive and Negative Affect Schedule (PANAS), Geneva Emotional Music Scale (GEMS), and some demographic questionnaire were also used. Findings show that three kinds of recitations had no significant impact on the skin conductance (recitation without melody, *Hicazmaqam*, and *KurdiMaqam*); however, the third recital (*Rastmaqam*) had a significant effect on the skin conductance ( $p < 0.05$ ). There was no significant effect of all recitations on heart rate. The mood response mean, both before and after listening to all stimuli, also demonstrated no significant difference. However, there were significant differences on emotional assessment both before and after listening to each stimulus, and a significant difference on some emotion categories of the effect of listening to Quran recitations based on the different melody. The recitation without melody influenced a lower level of wonder, transcendence, power, tenderness, nostalgia, and peacefulness emotion categories, though it increased tension. The *Hicazmaqam* (second stimulus) had a significant effect on the transcendence emotion, but still affect a higher tension level. The *Rastmaqam* (third stimulus) influenced the peacefulness emotion significantly, and impact a lower level of tension. The *KurdiMaqam* (fourth stimulus) had no significant difference on the effect on all nine categories of emotion. The *Rastmaqam* showed the most powerful outcome in this study. We recommend *Rastmaqam* can be applied on Quran recitation therapy for tension treatments.

**Keywords:** Quran Recitations, *Maqam*, Psychophysiological measures of Emotion

## INTRODUCTION

One reason why people listen to music is because it can evoke particular emotion (Juslin & Västfjäll, 2008). Music is indeed able to be an effective stimulus eliciting strong emotional reactions such as thrills and tears (Goldstein, 1980). In this way, music is a unique direction that evokes emotions in the auditory domain (Khalifa, Isabelle, Jean-Pierre, & Manon, 2002). The effect of listening to music on psychophysiological response has been abundantly researched and discussed. Physiologically, this measurement cannot be separated from autonomic response which can offer reliable indices of emotional reactions (Khalifa et al., 2002). Many physiological variables such as skin conductance, heart rate, facial EMG, and brain activity are related to the emotional dimension (Gomez & Danuser, 2004). However, the discussions and investigations into the effect that Quran recitations, which have a different harmonious melody, have on the physiological and psychological response are still insufficient.

The majority of studies in music and emotion in the last few decades have focused on western music as the stimuli (Koelsch and Jentschke, 2010; Umemura and Honda, 1998; Vanderark and Elly, 1993). Undoubtedly, this kind of stimuli cannot be equated with Quran recitation. The rules extracted and applied to the Western music customarily do not fit the local traditional music (Kizrak, Bayram & Bolat, 2014). This information has led to a very limited discussion of research in eastern or middle-eastern traditional music.

On the other hand, although the research about the effect of listening to Quran recitations has also been

widely practised particularly in medical science, the decided conclusion and the applied information are still in a very general level. Many researchers used Quran recitation only as an intervention to reduce anxiety and stress levels on patients, and compared to the baseline as a control condition. For instance, Babamohamadi, Sotodehasl, Koenig, Jahani and Ghorbani (2015) tested the effect of Quran recitation on anxiety in haemodialysis patients. They found that Quran recitations were effective in reducing anxiety in the intervention group, compared to the control group which showed no decrease in anxiety level. Ildar, Saleh, and Mazloom (2003) concluded that there is a significant reduction in the degree of stress signs on pulse, respiration and blood pressure on patients before heart surgery. Mottaghi, Esmaeli and Rohani (2011) concluded that Quran recitation affects the anxiety level of athletes. However, they did not specify what kind of specific melody of the recitation that was used in these experiments.

Furthermore, other research has tried to compare the Quran recitation with the western music or classical music as the stimuli in their experiments. For instance, Al-Galal, Alshaikhli, Rahman and Dzulkifli (2016) compared the Quran recitation stimuli with some relaxing music such as Mozart and jazz music to understand brain wave signal based emotion recognition by using EEG. They found that both the Quran and music can affect positive valence. Similarly, Tagharrobi (2014), Aghajani and Mirbagher (2012) analysed the effect of Quran recitations and music on the anxious patients before abdominal surgeries. Zulkarnaini, Kadir, Murat, and Isa (2012) examined the

effect of listening to Quran recitation and classical music on the brain wave signal for the alpha band. The result shows that, compared to the classical music, listening to Quran recitation is possibly more likely to increase the alpha band. Consequently, listening to Quran recitation can result in a more relaxing and alert condition compared to classical music. These studies conclude general outcomes that are quite influential. Both Quran recitation and music can be able to influence psychophysiological measures on humans. However, neither of these studies provide any evidence about the effect of Quran recitation based on different melodic modes (*maqam*), specifically. In the present paper, the researcher reports the effect of listening to Quran recitation based on the *maqam* melody particularly on skin conductance response, heart rate, and subjective mood and emotional response.

Based on the history of Islamic culture, there are various forms of vocal music, which have been generated relating to the Quran (Shokouhi& Yusof, 2013). The important one is Quran recitation as well as Azan (call to prayer) which is being performed several times each day in Muslim regions. Many types of melodic modes (*maqams*) have been taught for years to be applied for reciting the holy Quran and Azan (Shiloah, 1993). Each of these melodic modes has a different name, such as *Rast*, *Saba*, *Bayat*, *Sigah*, *Kurdi*, and *Hicaz*(Shokouhi& Yusof, 2013).

The melody of Quran recitation is familiar as a spiritual music that has a pleasant rhythm (Mottaghi et al., 2011). The holy Quran recitation is believed to have unique qualities and effects on the human body (Abdollahzadeh&Abdollahzadeh, 2000). Listening to the Quran can possibly provide a positive effect and help subjects to be in a resting and calm state (Abdullah and Omar, 2011; Hammad, 2009). This conclusion is supported by Mahmood, Malook, and Riaz (2007) who found that the rhythm of the Quran can enormously reduce depression level. Another study reported that Quran recitation could be used as a non-pharmacological and safe procedure for decreasing anxiety and improving vital signs (Majidi, 2004; Eskandari, Keshavars, Ahayeri, Jahdi& Hosseini, 2012). Certainly, this conclusion cannot be separated from the characters and the psychoacoustic principles of music attached to Quran recitation, so that it can be functionalized as one type of relaxing music which is sufficient to reduce stress, anxiety, and depression.

Al-Antaki identified the various modes and melodies by their characteristics and appropriate accord (Shiloah, 1995). This modal system is not only interpreted as a simple musical scale; it also consists of rules related to the melody (Kizrak, Bayram&Bolat, 2014). Music therapy theory has had powerful applications since the fifteenth century. During this period, both medical and musical writings provided detailed information, in which the melodic modes (*maqam*) under their specific names replace the regular melody patterns of Al-Antaki. There was also an assumption that different *maqams* correlate with healing procedures. Some found that the two most significant modes are the mode *Rast* which can be good for hemiplegia, and the mode *Iraq* which can help

acute brain diseases recoveries, such as vertigo, pleurisy, and breathlessness (Shiloah, 1995). Furthermore, it is a familiar theory that *maqam* implies mood (Ioannidis, El Gomez, & Herrera, 2011).

This study was arranged to examine the effect of listening to the Quran recitations on psychophysiological measurements of emotion. Specifically, this study aims to investigate whether listening to Quran recitations have an influence on the skin conductance, heart rate, mood and emotion; additionally, this experiment aims to understand the effect of listening to Quran recitations based on different melodic modes (*maqam*) on the psychophysiological response.

## METHODS

### *Participants*

22 Indonesian Muslim students were participating in this study (age range= 23-44) consisting of 10 women (45.5%), and 12 men (54.5%). Indonesian students were chosen based on their mother tongue language to filter the understanding of Quran recitation in the Arabic language. These participants are all postgraduate students in the same university, who came from different backgrounds, and none were professional musicians. Musical experiences of the subjects ranged from individuals with a few years musical training (7 people=31.8%) on various instruments such as the drum, flute, keyboard, and guitar, to those with no musical training (15 people=62.8%).

Based on the socio-demographic data, 18 (81.8%) participants have studied Arabic before, ranging from basic level (81.8%) to intermediate level (9.1%) and four others (18.2%) have not. Furthermore, three participants (13.6%) admitted that they understood the meaning of the recitation, 13 participants (59.1%) answered that they do not know, and six participants (27.3%) were not that sure.

### *Stimuli*

Stimuli consisted of four different Quran recitations in the Arabic versions, of which three of them were chanted in different melodic modes (*maqams*); and one of them was conveyed without *maqam*. The melodies of the recitation were randomly selected by the singer based on the different professional Quran reciters. The melodies were then imitated and recorded. Each of the melodies is distinguished and informed by a professional *maqam* musician. The stimuli can be described as follows:

1. First stimulus: the recitation without using melody. It was delivered in flat mode and non-harmonious melody.
2. Second stimulus: this recitation used a *Hicazmaqam* which imitates a professional reciter, namely SyeikhMishary Rashid al-Afasy, an Imam of the Grand Mosque of Kuwait.
3. Third stimulus: this recitation used a *Rastmaqam* imitating Sheikh Abdullah Awad al-Juhany. A professional reciter and an Imam in Mecca.
4. Fourth stimulus: this recitation used a *Kurdimaqam*, following the melody recited by

Muhammad Taha Al-Junayd, a Hafiz and professional reciter from Bahrain.

The verse and chapters used for this experiment were randomly selected, and all the recitations are the same verse and chapter. This decision was taken to filter the possibility of participant's response, caused by the meaning influence of different verse and chapter. These recitations had only been used in this study, as there are limited examples of Quran recitations delivered with and without *maqams* by the same reciter. The presentation of each recitation was 2.24 to 2.43 minutes and played by Windows Media Player software.

### **Procedure**

The researcher contacted the university's Indonesian Society by email to ask for participants who are interested in participating in her study. 22 people volunteered to be participants, and each of them contacted the researcher individually to decide the best time when they were free for the experiment. This experiment was conducted separately with each participant, which was located in the listening laboratory of the Music Department, the University of York.

Participants were requested to sit in a comfortable chair in the laboratory facing a laptop. A brief description about the experiment and the sensor was given to each participant, and an online consent form was also presented before the experiment began. All information and data collected in this study are confidential.

Two Shimmer GSR sensor cables were attached to the fingers to detect the participant's skin conductance response, and another one was attached to the tip of the earlobe to detect their blood volume pulse, which was then interpreted as heart rate mean. Participants were asked to position themselves as comfortable as possible during the experiment and asked not to move their hand or head that was attached to the sensor during listening to the recitation or during the baseline time. Then, before listening to stimuli, the Positive and Negative Affect Schedule (PANAS) questionnaire and the Geneva Emotional Music Scales (GEMS) were administered to the participants as the pre-test. These questionnaires were provided online, and each participant completed them on a PC.

Next, the first baseline was recorded for 30 seconds. Later, they listened to the first stimulus and filled in the GEMS questionnaire. The stimuli were presented at a comfortable volume. The same procedure continued with the second baseline, second stimulus, and second questionnaire until the fourth stimulus. After the experiment ended, they filled in the PANAS questionnaire as the post-test.

### **Data Recording**

There were two conditions in this experiment: 1. The baseline condition, as when the participants do nothing for 30 seconds before listening to each stimulus, and 2. The condition when they listen to each stimulus. Both conditions were recorded and then analysed by using Matlab and SPSS software.

The skin conductance and heart rate were recorded using Shimmer3 GSR+ unit. This unit is managed by using the Consensus Software application. To monitor the skin conductance and skin resistance, two electrodes were attached on the participant's finger, both on the index and middle finger. The other one was attached on their ear to observe the heart rate. This GSR record the Photoplethysmogram (PPG) data that was passed through the PPG-to-HR algorithm which then converts the signal to a heart rate (bpm). The data was digitized with a sampling frequency of 128 Hz. Each step of the experimental procedure was managed by clicking the event marker to categorize the baseline session and stimuli sessions. After the measurement, the data was exported to an excel file to be re-referenced to the mean rate which then was statistically analysed.

Furthermore, two kinds of the questionnaire were used in this research, the Positive and Negative Affect Schedule (PANAS) and the Geneva Emotional Music Scale (GEMS-45) questionnaire. The GEMS questionnaire was constructed to measure musically evoked emotions (Zentner, 2009). Indicatively, this questionnaire contains 45 labels that have shown to be consistently chosen for describing musically evoked emotive states across a relatively wide range of music and listener samples. These 45 items are divided into nine emotion categories; those are: wonder, transcendence, power, tenderness, nostalgia, peacefulness, joyful activation, sadness, and tension (Zentner, 2009). When completing this questionnaire, the participants were instructed to describe how the music makes them feel, not to describe what the music may be expressive of. Both of these questionnaires were provided with one to five ratings, where one is 'not at all' and five is 'extremely', and organized by Qualtrics. Data was then exported into SPSS file to be analysed statistically.

## **ANALYSIS AND RESULT**

To measure the effect of listening to Quran recitations on the skin conductance and heart rate, a Paired T-Test was carried out to compare the mean of the baseline which is the condition before participants listened to the stimulus and the mean of stimulus which is the condition when participant listened to the piece. The results shown in Table 1 indicate that there was no significant difference of the skin conductance mean between the first baseline and the first stimulus, which is the recitation without melody,  $t(21) = 0.87, p > 0.05$ . The same result was shown on the second paired sample t-test (baseline 2 versus stimulus 2),  $t(21) = -1.05, p > 0.05$  and fourth paired t-test (baseline 4 versus stimulus 4),  $t(21) = 0.68, p > 0.05$ . However, there was a significant difference on the third paired sample t-test, which is between baseline 3 versus stimulus 3,  $t(21) = 2.16, p < 0.05$ .

**Table 1. Significant value of skin conductance mean between baseline and stimuli with paired t-test**

		Mean	SD	t	df	Sig
Pair 1	Baseline1_SCL - Stimulus1_SCL	.15	.78	.87	21	.393
Pair 2	Baseline2_SCL - Stimulus2_SCL	-.16	.69	-1.05	21	.307
Pair 3	Baseline3_SCL - Stimulus3_SCL	.32	.69	2.16	21	.043
Pair 4	Baseline4_SCL - Stimulus4_SCL	.13	.87	.68	21	.504

Additionally, considering the heart rate measurements, there was no significant difference between baseline and stimuli in all pairings ( $p > 0.05$ ) as shown in Table 2.

**Table 2. Significance value of the heart rate mean between baseline and stimuli with paired t-test.**

		Mean	SD	t	df	Sig.
Pair 1	Baseline1_H R - Stimulus1_H R	.00	3.26	.002	21	.999
Pair 2	Baseline2_H R - Stimulus2_H R	-1.19	4.01	-1.402	21	.175
Pair 3	Baseline3_H R - Stimulus3_H R	-.01	3.82	-.013	21	.990
Pair 4	Baseline4_H R - Stimulus4_H R	.33	3.17	.483	21	.634

Therefore, three of these differences were accepted as not significant, with the exception of the third stimulus. The hypotheses of the effect of listening to Quran recitation on the skin conductance response is thus explicitly confirmed only for the third stimulus. However, this assumption is not confirmed for the heart rate measures. Thus, it can be concluded that there is no effect of listening to Quran recitation on heart rate.

The different mean of positive affect on the PANAS scale between before and after participant listened to the stimuli was assessed using Paired T-Test to see whether there is a significant difference. The result indicates that there is no significant difference on the mean of positive mood scale before and after they listened to stimuli ( $p > 0.05$ ). The negative mood scale between before and after listening the stimuli also indicates that there is no significant difference ( $p > 0.05$ ); this result shows in Table 3. This indication means that listening to Quran recitation does not affect positive mood significantly.

**Table 3. Significance test of positive and negative PANAS questionnaire mean by using paired sample t-test.**

		Mean	Std. Deviation	t	df	Sig. (2-tailed)
Pair 1	Mean_Panas1_Positive - Mean_Panas2_Positive	.04545	.89853	.237	21	.815
Pair 2	Mean_Panas1_Negative - Mean_Panas2_Negative	.09091	.52636	-0.81	21	.427

Furthermore, the same test was applied to investigate the overall total mean rate of the emotion questionnaire (GEMS) response between before and after listening to each piece.

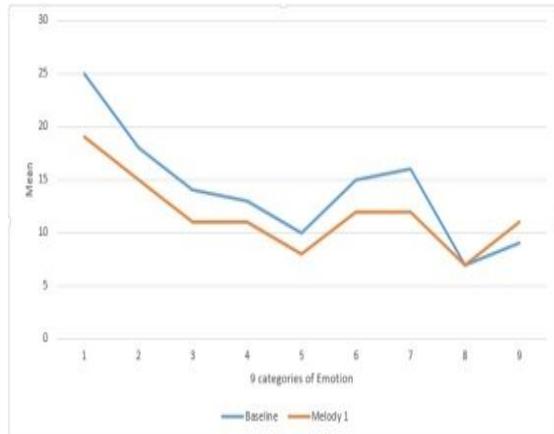
**Table 4. Paired sample t-test of nine different categories of emotion between before and after listening to the first recitation (without maqam).**

		Mean	Std.	T	df	Sig. (2-tailed)
Pair 1	Wonder-wonder1	6.14	5.38	5.35	21	.000
Pair 2	Transcendence - transcendence1	2.86	4.43	3.03	21	.006
Pair 3	Power - power1	3.14	4.21	3.49	21	.002
Pair 4	Tenderness-tenderness1	2.82	3.55	3.72	21	.001
Pair 5	Nostalgia-nostalgia1	2.32	2.90	3.75	21	.001
Pair 6	Peacefulness-peacefulness1	3.36	4.30	3.66	21	.001
Pair 7	Joyful_activation - Joyful_activation1	4.23	3.84	5.16	21	.000
Pair 8	Sadness-sadness1	-.45	3.49	-.61	21	.548
Pair 9	Tension - tension1	1.18	3.33	1.67	21	.111

Table 4 shows that all emotion categories (wonder, transcendence, power, tenderness, nostalgia, peacefulness, and joyful activation) indicate a greater outcome than two other categories, which are sadness and tension. This indication means, there is a significant difference in the effect between before and after participants listened to the first stimulus ( $p < 0.013$ ).

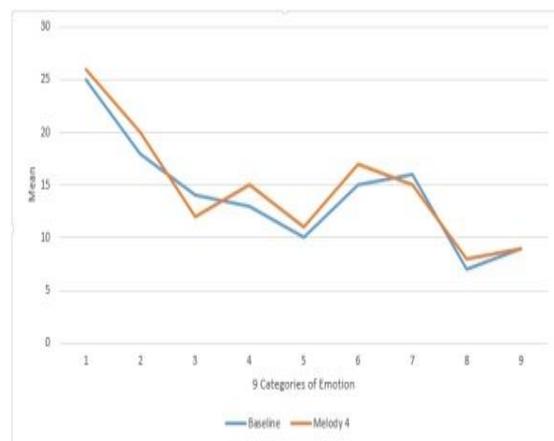
Graph 1 represents the means of the nine different emotional categories, as suggested by Zentner (2009),

between before and after the first stimulus, which is the recitation without melody. The horizontal axis shows nine categories of emotions that are sorted as follows: 1. wonder, 2. transcendence, 3. power, 4. tenderness, 5. nostalgia, 6. peacefulness, 7. joyful activation, 8. sadness, and 9. tension; and the vertical axis represents the means value. From this chart, it can be seen that there is a lower tendency on the wonder, transcendence, power, tenderness, nostalgia, peacefulness, and joyful activation, but the same level of sadness and a greater degree of tension after participants listened to this recitation.



Graph 1. Different emotional response between before (blue line) and the after listening to the first stimulus (red line)

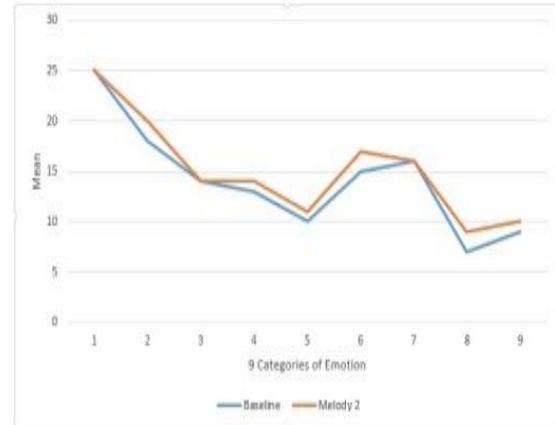
The outcome between the baseline and the second stimulus (*Hicazmaqam*) demonstrates that only one emotion indicates a significant value (transcendence),  $t(21) = -2.76, p = 0.013$ . Yet, almost all indicators, such as wonder, power, tenderness, nostalgia, peacefulness, joyful activation, sadness, and tension show that there was no significant difference ( $p > 0.013$ ). Furthermore, Graph 2 below shows that listening to this piece can still affect a higher level of tension.



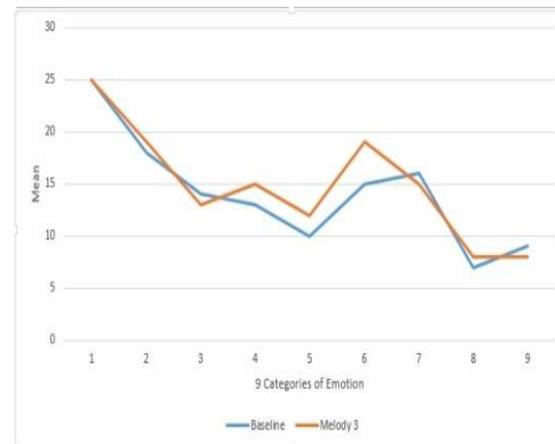
Graph 2. Different emotional response between the before and after the second recitation (*Hicazmaqam*)

The comparison between before and after listening to the third stimulus (*Rastmaqam*) shows a significant difference between those two conditions on peacefulness category ( $t(21) = -3.78, p < 0.013$ ). On the other hand, eight other categories present no significant

value. Additionally, from the Graph 3, it can be seen that this maqam also influences a lower level of tension.



Graph 3. Different emotional response between before and after the third recitation (*Rastmaqam*)



Graph 4. Different emotional response between the before and after the fourth recitation (*Kurdimaqam*)

Lastly, the baseline was then compared to the last recitation (*Kurdi maqam*). The effect between before and after listening to this maqam was not as significant as the three previous stimuli ( $p > 0.013$ ). All of these tests apply a Bonferroni correction with a confidence interval of the difference is 98.75%, and it can be drawn that although there is an increased tendency on the transcendence, tenderness, nostalgia, and peacefulness, however, there is no significant difference on the effect on all nine emotion categories ( $p > 0.013$ ).

## DISCUSSION

This experiment was conducted mainly to understand the effect of listening to Quran recitations on the skin conductance, heart rate, mood, and emotional response. An important outcome was found on the *Rastmaqam*; it shows a significant effect on the skin conductance and on the emotion scale (peacefulness). This *maqam* seems to be the most powerful melody influencing autonomic nervous system which can be observed by skin conductance

changes. This finding supports Farmer's statement (1929) that one of *maqam* melodies, such as *Rastmaqam* can evoke the joyful emotion. Khalfa et al. (2002) assumed that mainly, musical emotional arousal can invoke and modulate skin conductance response. Chen, Tsai, Huang, and Lin (2013) compared pleasant and unpleasant music on the patients with one-sided impairment after stroke and concluded that pleasant music can improve positive mood and arousal. Based on this finding, *Rastmaqam* can be very useful for intervention to improve happier emotions than the other *maqam*.

The results of this study can be used as a reference for music therapy applications based on the Quran melody. There has been extensive research on Quran recitation as an intervention to improve human health, to decrease anxiety and stress level (Babamohamadi et al., 2015; Aghajani&Mirbagher, 2012; Hammad, 2009).

From the findings created in this study, using the recitation without melody can decrease joyful emotion such as wonder, transcendence, tenderness, nostalgia and peacefulness, whereas it can increase tension emotion which is definitely not safe to be applied for therapy, for instance an intervention to reduce anxiety or depression; because stimulus that can generate tension and unhappiness can have an impact on increasing stress level (Cabrera & Lee, 2000).

In contrary, all the recitations with *maqam* melody can increase some category of emotions such as transcendence, and peacefulness and decrease tension. Notably, *Hicazmaqam* in recitation can increase the transcendence emotion, but still can increase some tension; *Rastmaqam* can increase peacefulness feeling and also reduce tension. *Kurdimaqam* can increase transcendence, tenderness, nostalgia and peacefulness, but the effect is not significant. Thus, it can be recommended that *Rastmaqam* may be useful for Quran recitation therapy application in the treatment of tension.

The non-significant results of physiological response can be due to several reasons. First of all, there are different kinds of listeners (Hevner, 1936). In the present study, the researcher only invited participants who are not musicians and did not compare them to musicians. Winold (1964) noted that perhaps successive research should consider using more responsive populations such as children and musicians to be able to get a stronger result.

Secondly, the same musical element such as tempo may also cause insignificant results to the physiological measurements made in this experiment, the given Quran recitations in this experiment have the same tempo, albeit recited in different melody; as musical intensity variation such as tempo can also affect the physiological response of humans (Wedin, 1972; Gomes & Danuser, 2007).

Thirdly, the level of belief and religiosity which is influenced by the environment and culture may also predispose the outcomes, since Quran recitation is one of the most essential elements of Islam. For Muslims, reciting the Quran or listening to Quran recitation can be a way for remembrance

to God (Salam, Wahab & Ibrahim, 2013). Therefore, this activity can elicit the physiological relaxation response (Ahsan & Khan, 2012). Unfortunately, in this study researchers did not apply further questions about the level of religiosity or the intensity of Quran recitation they listen to usually.

Fourthly, familiarity to music can also affect one's physiological condition. Fontaine and Schwalm (1979) compared familiar and unfamiliar music with 35 subjects, and they found that familiar music can significantly increase heart rate. However, not all Muslims are accustomed to listening to Quran recitations with the melodies applied in this experiment. Ali and Peynircioglu (2010) found that familiarity plays a role in modulating a listener's emotional response to music.

Previous studies that investigated whether music effects can evoke autonomic nervous system response had inconsistent results (Krabs et al., 2015). Such as an experiment from Yamashita, Iwai, Akimoto, Sugawara, and Kono (2006); they found that there was no effect of music on the autonomic nervous system. Thus, there are no consistent views regarding the effects of listening to music on heart rate.

## CONCLUSION

To conclude, compared to the baseline condition, Quran recitation does not have any influence on heart rate. Some recitations have no significant effect on the skin conductance, such as recitation without melody, recitation with *Hicaz* and recitation with *Kurdimaqam*. However, Quran recitation with *Rastmaqam* can significantly affect the skin conductance and on the peacefulness emotion. The mood scale mean indicates that listening to Quran recitation does not affect positive mood significantly. Furthermore, each different melody of Quran recitation can evoke a distinctive emotional response. We recommend that the *Rastmaqam* can be considered to be applied on Quran recitation therapy for tension treatment.

This study only used three different *maqam* melodies, it is recommended that further studies should be done to examine the effects of listening to Quran recitation based on the other different *maqam* melodies on psychophysiological measurement, since there are many kinds of *maqam* melody. The result then can be considered as a comparison of complementary music therapy for Muslims that is widely available and less expensive based on *maqam* melody. Also, additional research using different comparison is required to validate these findings.

There are many shortcomings in this study. However, it is still expected that the results in this study may contribute to some research with the similar interest in the future.

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