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Comparing The Spectral Profiles of The Javanesse Gending with The Classical Music As The Therapeutical Music

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ABSTRACT

Objective: So this study is trying to analyze the potency of Javanesse Gending as the therapeutic music. It is a further exploration of the finding state that the Gending Tejanatha has the spectral characteristic similarity with The Magic Flute of Mozart.
Material and methods: The study was done by analyze the audio characteristics patterns of five Javanesse Gending (JG) compare with the five classical music (CM) of Mozart and Beethoven. The audio characteristics were obtained from the sound analyzer program. The results were in form of spectral graphics. The parameters include spectral envelope, sound intensity and frequency.
Result: JG and CM have different pattern for the left and the right audio. This indicate difference stimulus for the neural, that will appear as cross references for primary audiory area. The frequencies of JG is higher than CM. The frequency and envelope indicate the variation of emotion that will be induced. It represent the sound colour (timbre). The JG timbre is determined by the material of the instruments, used to made from copper or iron. This material does infuence the emotional responses, especially to the player (pengrawit). The influence of the timbre, not as intens as the influence of the musical tempo that relate with the rhythm harmony. In the JG, the musical tempo represent the soul of this music. It is very essential. The tempo changes from the usual pattern will raise the anxiety.
Conclusion: It can be concluded that the JG has the same potency as the CM to be used as therapeutic music. The JG has the higher potency to influence emotional state than the CM due to its envelope profile.

1. Introduction

Music have been known to used as a therapeutic tool in the treatment method of complementary (alternative) medicine. Some scientific research has also proven that music has a positive effect on health. Nevertheless, the use of music as a means of therapy has not been widely recognized in the medical world, even inviting skeptical attitudes. This is due to the mechanism of induction of the music sound system physiology is still unclear. These conditions lead to the emergence of studies on the issue.

Classical music is the kind of music that is commonly associated with the physiological and psychological human being so widely used for therapeutic purposes. The effects of classical music on the human body has been widely studied. Mozart Sonata played by two pianos in D major tone (K448) can strengthen the ability of spatial-temporal reasoning [1]. Recent research shows that if played with tempo Adante (walking), classical music can lower the average of blood pressure, heart rate, respiratory rate, and the tension ahead of the operation [2]. However, for the Java community, Javanesse Gending proven to be more effective ($p < 0.05$) decrease pain and anxiety in women who give birth [3] when compared to Mozart. This is suggested that ethnic and cultural background do influence the research subject, especially if it is associated with the psychological aspects. Loth [4] states that patient involvement in therapy process by playing Javanese gamelan affect the patient's emotions and behavior. Structures or patterns of music

usually has emotional expression, respectively [5]. Javanese music is the music produced by the gamelan, Javanese typical percussion instruments. Javanese gamelan has been widely recognized by the world community for a long time. This study aims to assess the potential of Javanese Gending to be used as a clinical music therapy, and the development of the study findings of Herawaty et al. [6] which states that Gending Tejanatha have similar spectral characteristics with Mozart's The Magic Flute.

2. Materials and Methods

The study was conducted by analyzing the audio characteristics of the five types of Javanese Gending and five types of classical music. Audio characteristics analyzed include aspects of temporal, spectral, and temporo-spektral (spectrum as a function of time). This analysis is obtained from sound processing program Sony Sound Forge 7.0.

3. Result

The results of the analysis using Sony Sound Forge 7.0 can be seen in Figure 2 for the temporal graphic, Figure 3 for the spectral graphic, Figure 4 for the spectral envelope graph, and Figure 5 for the temporo-spectral graphic (sonograf). The temporal graphic of musical sound is a graph showing the characteristics of musical sound intensity (vertical axis) along the playing time (horizontal axis). The spectral graphic shows the characteristics of musical sound intensity (vertical axis) in the frequency range that appears throughout the play time (horizontal axis). The spectral envelope graphic shows the changes of the spectral lines display, while the temporo-spectral graphic show the parameters interaction of the sound intensity (represented by the color chart) with frequency (vertical axis) along music playback time (horizontal axis). The preferences for the spectral music analysis can be seen in Figure 1. The graphics that is shown in this article are only the representation of the music type that were analyzed. The Javanesse Gending represented by Kebo Giro, the common gending used in wedding party, meanwhile the classical music is represented by Piano Sonata K.310 mvt. 1 that have the common sound heared as 'classical'.

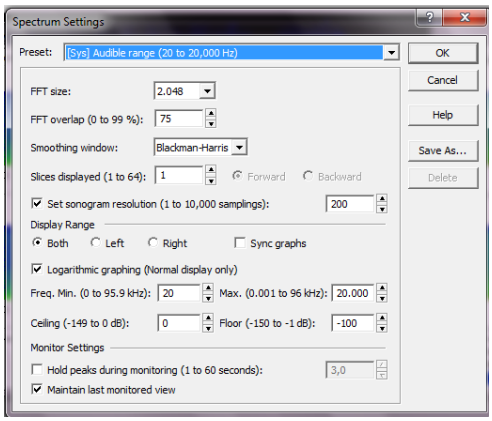

Figure 1. The spectral analysis preferences.

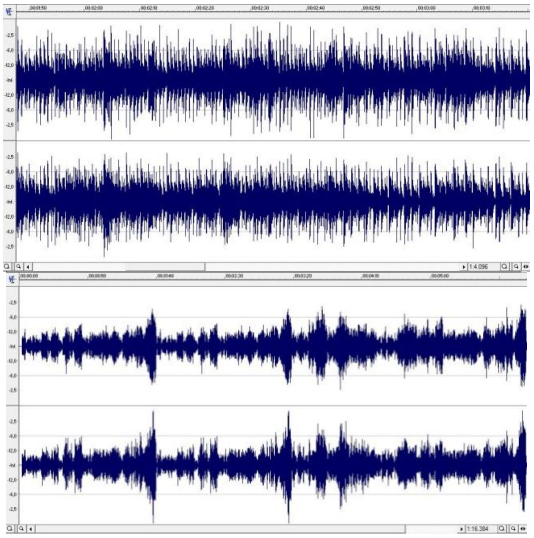

Figure 2. The temporal graph of JG (Kebo Giro, upper) and CM (Piano Sonata K.310 MVT 1, lower). It can be seen that the JG has more dynamic pattern than CM.

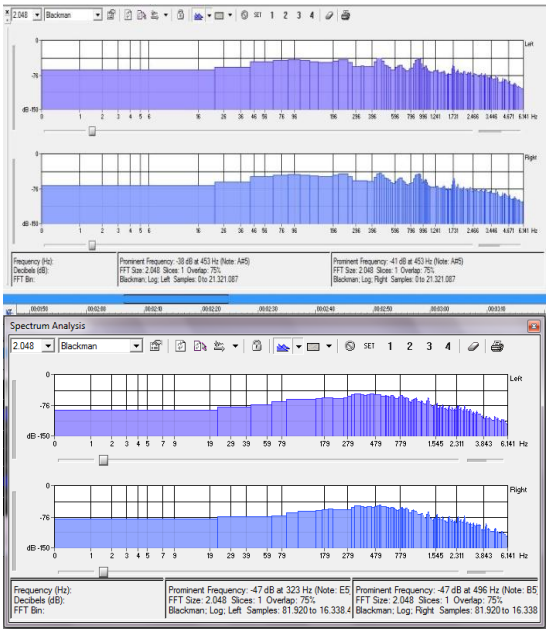

Figure 3. The spectral graph JG (Kebo Giro, upper) and CM (Piano Sonata K.310 MVT 1, lower) The both of graph show the differences between left and right sound component in the high frequencies.

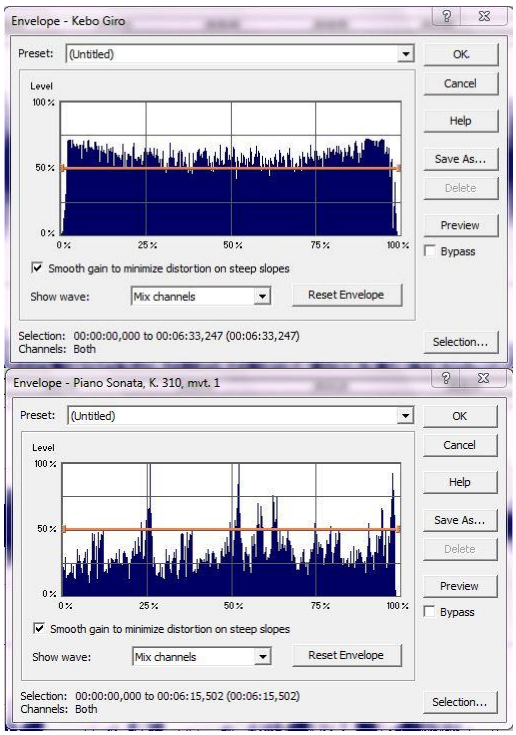

Fig 4. The spectral envelope for GJ (Kebo Giro, upper) and Mozart (Piano Sonata K.310 MVT 1, lower). It can be seen that the JG has more dynamic pattern than CM. The CM envelope shows some kind of the repetition pattern.

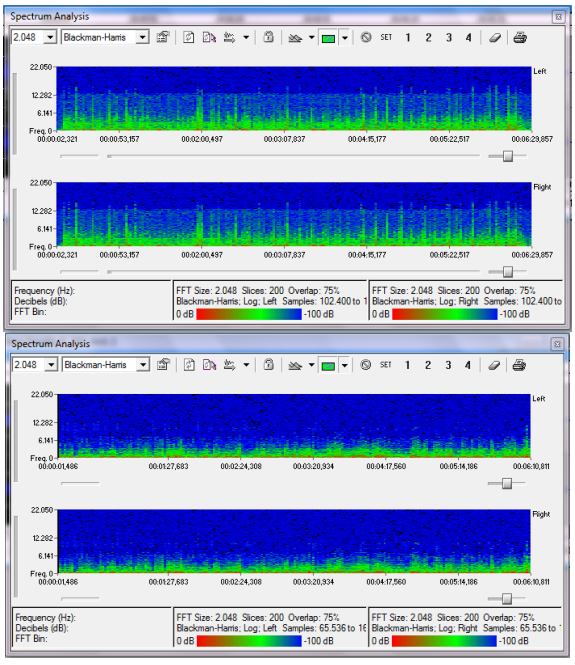

Fig 5. The temporo-spectral for GJ (Kebo Giro, upper) and Mozart (Piano Sonata K.310 MVT 1, lower). The JG shows background noise along the playback time eventhough the intensity pattern still look clear and sharper than the CM.

4. Discussion

Music is a human effort to express emotion [7]. It causes the music can affect mood, and evoke feelings. Music plays an important role in the communication process and deliver information in the form of semantic elements and emotional [8]. These elements indicate the involvement of the central nervous system and peripheral auditory system in the process of integration and interpretation of the sound signal. Psychoacoustic is the study of psychological responses to the perception of the physical characteristics of the basic sound [7]. Physical components of the sound emerging from the change in pressure due to the vibration of an object. Physical components of the basic sound is a function of frequency, amplitude and phase. Based on these three components, the complex sounds can be break down into basic sounds. The complex sounds breaking process into the basic sounds is done using Fourier analysis. In this case, harmony is the frequency component of a complex sounds.

Psychoacoustic characteristics of the music are not limited to the pitch, intensity, and timbre, but also involves rhythm. Rhythm is the variable of time [9]. The combination of elements and musical psychoacoustic allows the emergence of complex patterns of musical melodies from the combination of the units of simple sound. In this case, the variable time and frequency are equally important role in shaping the perception of the sound signal in the primary auditory cortex [10]. The study of percepting music and the mechanisms of their effects on humans can be done by [7] identify the types of music, studying the emotional experience that occurs while doing the music, studying the psychological and psychosomatic changes while doing the music, and learn the psychoacoustic characteristics of the music.

The temporal characteristics indicate changes in sound intensity (vertical axis) in the range of the music playback time (horizontal axis). Sound intensity (dB) also showed the strength of music sound. The temporal characteristics represent the physical components of the processed sound of the human auditory system, directly to the primary auditory area without first passing through the limbic system. Mozart Piano (Piano Sonata K.310 MVT. 1) and Javanesse Gending (represented by Kebo Giro) shows the similarity patterns. These both types

produce high enough temporal variation of the intensity. The spectral graph shows the variation of sound intensity in the frequency range of music that emerged during the playing time. Javanese Gending and Mozart Piano show different patterns between right and left of the intensity variation in the high frequency range. The difference in sound intensity variation for left and right audio will result in differences in the auditory stimulus to the nervous system at the right and left ear. This means there is a cross reference to the primary auditory area. If viewed in the form of spectral envelope, Kebo Giro graphs show a more dynamic character than Mozart Piano. Changes in the dynamic spectral envelope shape is indicative of changes in the type of emotion that is triggered. In this case the Javanesse Gending is more likely to trigger a variety of emotions, when compared with Mozart Piano. Spectral envelope reflects the color of the sound. The colors sound of the human auditory system can be recognized from the aspects of rhythm, but the actual color of sound emerging from the material properties of the instruments [11]. The sound color is one of the musical character that has a psychophysical dimension in the sense that is able to influence the emotional state of the listener. Other psychophysical character is tempo, pitch, and dynamics of the music. The last three characters are now widely studied to explore their effects on the changes of the human emotion. The sound color of Java Gending is determined by the material of gamelan musical instruments. The materials that commonly used are bronze or iron. Material differences of the instruments constituent of gamelan was indeed raise a different emotional response in the listener [12], especially in those who used to play (pengrawit - gamelan). According to Salim [12] the effect of the difference in sound color, in the Javanese gamelan, not as intense as the effects associated with the alignment tempo rhythm. In Javanese music, the tempo is expressed as 'soul', is a very essential element. The changes of tempo that is used to listen to be more quickly or slowly resulting in a strong negative response, which leads to anxiety. If the musical spectrum are presented temporally, concurrently with the measurement of the intensity of sound at playback time, it appears that the pattern of sound intensity (bright color spectrogram) Javanese Gending similar with Mozart Piano, eventhough there exist the background noise a long the playback time. So, it can be said that the Javanese Gending has similar characteristics with Mozart Piano, but have more dynamic characteristics.

5. Conclusion

Referring to the results of the analysis of the temporal, spectral, and temporal spektro, Javanesse Gending have similar characteristics with Mozart Piano. This suggests that Javanesse Gending has the same potential to be used as a Mozart Piano music therapy clinical. However Javanesse Gending has a higher ability to influence the emotional state. The potential is evident from the characteristic of spectral envelope.

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Conflict of Interest

The authors report no conflicts of interest

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