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The Effect of Music Therapy on the Stress Levels of Medical Students at Universitas HKBP Nommensen

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Abstract

This research explores the effect of music therapy on the stress levels of medical students at HKBP Nommensen University. With high study loads and academic pressure, medical students often experience significant stress. For this reason, this research adopts a box music therapy (BmT) approach, which combines technology and music to provide a therapeutic experience. In this study, heart rate (BPM) and galvanic skin response (GSR) sensors were used to measure participants' physiological changes before and after music therapy sessions. The measurement results showed a decrease in BPM from 120 before therapy to 100 after, and a decrease in GSR from 588 to 300, indicating a real relaxation effect. A questionnaire filled out by 28 students showed that 65% of respondents agreed that music therapy helped reduce stress, while 30% strongly agreed. Only 5% felt they were not helped, indicating a significant positive impact for the majority of participants. The music chosen in this therapy plays an important role, with song choices that support a calm atmosphere, including classical and pop music. This study confirms that music therapy is an effective strategy for stress management among medical students. Implementing this therapy in an academic environment can improve students' mental health and their quality of life while undergoing intense education.

Keywords: Effect of Music Therapy, Stress Levels, Students, UHN

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INTRODUCTION

Students, as academic people, in their activities are also inseparable from stress. Stressors or causes of stress in students can originate from their academic life, especially from external demands and demands from their own expectations. (Mutakamilah M,et,al, 2021) External demands can come from coursework, course loads, parents' demands for success in college, and social adjustments in the campus environment. These demands also include lecture competence and the increasing complexity of lecture material which is increasingly difficult. The demands of student expectations can be sourced from the student's ability to follow the lesson[Afryan M, Saputra O, Lisiswanti R, 2019].

Based on research conducted by a national study on students, as many as 200,000 new students in more than 400 universities experience academic stress, while the estimate for students in the world who experience academic stress is 38 -71%, while the

prevalence in Asia is 39.6% -61%. .3%(Wahyudi, et.al and Rahmayani, et al, 2017). The busiest students in the learning system are medical students. Medical students often face high levels of pressure from various sources, including a heavy academic load, the demands of clinical practice that require a high level of emotional resilience, and high expectations from the academic and professional environment.(Cousin A,) Prolonged and uncontrolled stress can have a significant negative impact on the mental and physical well-being of medical students[Abdullah, J, et al, 2013].

This can have an impact on increasing the risk of mental health disorders such as anxiety and depression, as well as affecting students' academic performance and learning abilities. A holistic and evidence-based approach is needed to overcome this stress, which involves a combination of psychological, physical, social and behavioral strategies. [8,9,10] Academic stress that appears in students can be handled with several actions, namely training in emotion-based coping strategies, use of the GFR mindful mobile application, 5 finger hypnosis method and music therapy[Agustiningsih, N, 2019]. One intervention that is effective in reducing academic stress in students is music therapy. Research results from Prasetyo (2017) state that music therapy can be used to reduce academic stress levels in students at SMAN 5 Banda Aceh. Similar things were done by other researchers who stated that Mozart music therapy could reduce stress in students by listening to this music (R, Rosanty, 2014).

This research offers BmT as something different where this tool is filled with several instrumental music by the researcher himself as well as works by composers from Indonesia. One of the musical works contained in BmT is the composition Alam Menyapa (https://youtu.be/3JWTb2STAUY) This musical work is a development of the bird song composition which was once used as therapy music for drug rehabilitation patients at the Mutiara Abadi Binjai Foundation [Batubara J,et al,2022]. The musical work 'Alam Sayapa' adopts natural sounds such as the sound of birds, the sound of river water, blowing wind which are then combined digitally with various western and traditional musical instruments.

Apart from this composition, another musical work that will be included in BmT is the composition 'The Rhythm Of Bird'. The idea for creating this composition was taken from the songs of the tual bird and the hill bird from the musical traditions of aboriginal people. This composition tells about urban culture which is interpreted by music in a programmatic way. This composition work has also been published in the Music Scholarship Journal (Batubara J, et al,2023, Batubara J, et al,2024]. Natural sounds such as the sound of birds in the morning, the sound of river water have the power of music therapy. This can be seen from the researchers' experience for both drug survivors and hypertension patients. In this study, the music therapy carried out was passive music therapy, the reason for choosing passive music therapy was because music therapy was cheap, easy and effective[(Batubara J,et al,2022, Galingging K,et.al,2024) Through this research, it is hoped that passive music therapy can have a positive impact on medical students at HKBP Nommensen University in reducing stress, so that they can be more optimal in carrying out their studies and dealing with various academic pressures.

METHOD

The research method used was Quasi Experiment with a One Group Pretest-Posttest design, involving 35 students as research subjects. The main tool used in this research is a Music Therapy Box (BmT), which is equipped with a collection of 16 songs and music, a GSR sensor to measure stress levels and a BPM sensor to monitor heart rate before and after music therapy sessions. The data collection process was carried out in several stages, starting with a music therapy session followed by completing a post-therapy questionnaire to obtain subjective data related to changes in stress levels. Data obtained from sensor measurements and questionnaires were then analyzed to assess the

effectiveness of music therapy in reducing stress levels. It is hoped that the results of this analysis will show the positive impact of music therapy on students' mental health, especially in dealing with academic pressure in the medical education environment.

RESULT AND DISCUSSION

Based on research conducted on the effect of music therapy on the stress levels of medical students at HKBP Nommensen University. Considering the high level of stress experienced by medical students due to heavy academic demands and emotional pressure, this study aims to explore the effectiveness of music therapy as a method for reducing stress. By using a therapy music box (BmT), which is equipped with a BPM sensor, GSR sensor and 16 musical instruments, this study analyzed changes in stress levels before and after therapy. Below we present the results of research that has been carried out.

Figure 1. Research Process

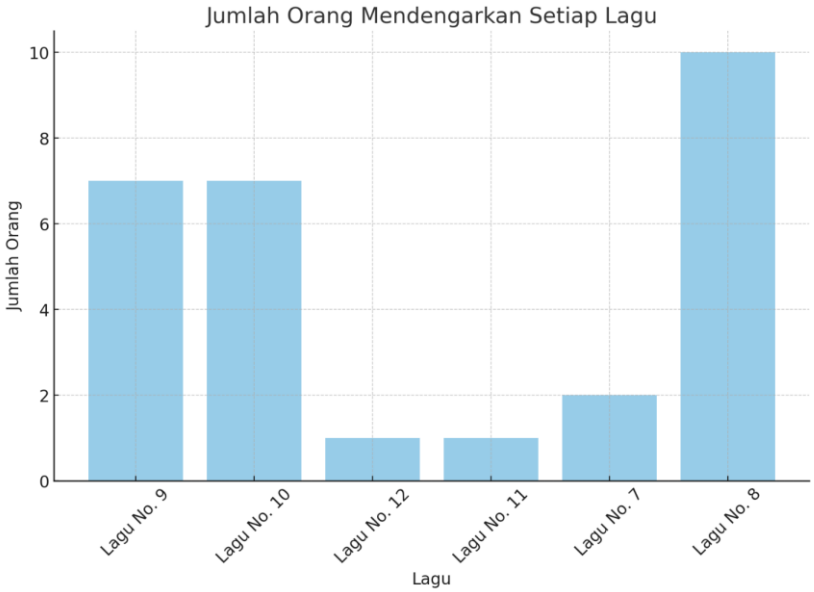

Figure 2. Songs/musical instruments listened to

Tabel 1. List Of Songs/Instrumental Music In BmT

Song Number	**Title**	**Description**
1	*After rain comes Sunshine*	
2	*Old activity*	
3	*Nature Says Hello*	**Instrumental**
4	*Human of the storm*	
5	*Dream*	
6	*In the Morning Shade*	
7	*I am grateful V1*	
8	*I am grateful V2*	**Vocals**
9	*Reflection*	
10	*Hum of Nature*	
11	*Hum an Angel*	
12	*The Power of the dream*	**Instrumental**
13	*Voice of Nature*	
14	*Water Sounds*	
15	*Song of the angel*	
16	*Blessing*	

Song No. 8 stands out as the most listened to song, with a total of 10 listeners. This is the highest number on the chart, indicating that the song is very popular among

listeners. Several factors may have influenced the popularity of Song No. 8 include the quality of the music, the relevance of the lyrics to the listener's feelings, or maybe this song is promoted more often. It can also be concluded that Song No. 8 meets the musical preferences of most listeners, both in terms of genre, tempo and emotional impression. Song No. 9 and Song No. 10 both have a total of 6 listeners. This is a fairly high number and shows that these two songs are also quite popular, although not as high as Song No. 1. 8. These two songs may have certain characteristics that attract listeners, such as similar genres or relatable lyrics. If we assume that the listeners who chose these songs have similar musical preferences, then Song No. 9 and Song No. 10 can be considered to meet the tastes of most listeners which are not too different from the tastes of those who listened to Song No. 10. 8.

Song No. 7 listened to by 2 people. This number shows that this song is less popular than Song No. 1. 8, no. 9, and No. 10. Although it is not as devoid of fans as Song No. 12 and Song No. 11, Song No. 7 remained at a low level of interest. Several factors may have contributed to the low interest in Song No. 7 could be due to different genres that do not suit the tastes of the majority of listeners, tempo or melody that is less interesting, or perhaps the theme of the song is not very relevant to most people. Song No. 12 and Song No. 11 had the lowest number of listeners, namely each was listened to by only 1 person. This indicates that these two songs are the least popular among all the songs available. Most likely, these songs will not match the preferences of most listeners. Factors such as tempo, genre, production quality, or even lyrics that may be difficult to understand could be reasons why these songs don't attract much attention. These two songs appear to have very limited appeal and may only appeal to listeners with specialized tastes.

Overall, these graphs show considerable variation in the number of listeners for each song, from very high (10 people for Song No. 8) to very low (1 person for Songs No. 11 and No. 12). This reflects differences in musical tastes among listeners. More popular songs like Song No. 8, no. 9, and No. 10 may have more universal characteristics or be easily accepted by listeners from various backgrounds. Meanwhile, less popular songs may only appeal to a very specific segment of listeners.

Listeners' preferences can be influenced by various factors, including age, cultural background, or emotional situation while listening to a song. Overall, these graphs help us understand how listeners' musical preferences vary and can be used as initial data in selecting appropriate music, both for general purposes and in therapeutic settings. The popularity of each song can be a reference for choosing songs that are more effective in creating a positive atmosphere for listeners or patients who need music therapy.

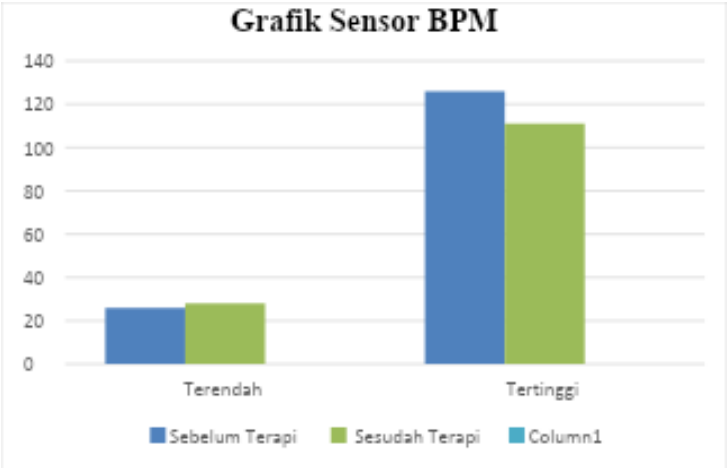

Figure 2. BPM sensor graph before and after therapy

The graph above shows changes in heart beats per minute (BPM) in two conditions: before and after undergoing music therapy. The blue color shows the BPM results before therapy, while the green color represents the BPM after therapy. This BPM data was measured to evaluate the effect of music therapy on participants' psychological conditions, especially in terms of reducing stress levels as reflected through variations in BPM. The higher the stress level, the BPM generally tends to increase due to the activity of the sympathetic nervous system which responds to psychological stress.

The part of the graph showing the “Lowest” value illustrates that the participant's BPM before therapy was in the range of 25-30, and this number decreased after therapy. A decrease in BPM to the lowest value indicates the relaxing effect obtained after listening to music, where the body switches to a calmer state. This music therapy helps reduce the physiological stress response in participants, so that the heart beats slower. In the lowest condition, lower BPM after therapy indicated that the music had a calming effect, helping participants regulate more stable emotional and physical responses in an initially stressful situation.

In the "Highest" section, the graph shows that the BPM before therapy reached around 120 BPM or more, indicating a high stress condition experienced by the participant. After participating in music therapy, this peak rate decreased to around 100 BPM. This significant reduction in the highest BPM shows the effect of music in suppressing the stress response in intense conditions or in situations that generally trigger anxiety. A reduced heart rate after listening to music indicates a decrease in sympathetic nervous activity, and an increase in activity of the parasympathetic nervous system, which functions to calm and restore balance to the body.

Changes in the BPM range, both lowest and highest, confirm the positive impact of music therapy in reducing mental and emotional tension. In the pre-therapy condition, BPM was at a higher level, both in the lowest and highest range, which indicates that the participant was experiencing psychological stress. After the music therapy session, BPMs in both ranges decreased, illustrating that music therapy helped calm their nervous systems and bring participants' bodies to a more relaxed state.

The effect of music therapy on heart rate is closely related to the working mechanism of music in influencing the brain, especially in areas responsible for emotions, such as the amygdala and prefrontal cortex. Music provides stimulation that helps reduce tension, and dampens the body's response to stress. With the influence of music, the parasympathetic nervous system is activated to slow down the BPM, and this effect can continue after the therapy session ends. The use of soft, low-tempo music or soothing

melodies in therapy sessions may have a significant contribution in helping participants achieve a deeper state of relaxation.

In addition, the decrease in BPM after music therapy indicated that participants experienced a decrease in stress-related physiological activity. A lower BPM indicated that the participant's body and mind shifted to a more relaxed state, resulting in significantly reduced stress responses. The decrease in peak BPM, which initially reached numbers above 120, and reduced to around 100 BPM after therapy, indicates the powerful impact of music in regulating participants' emotional responses.

Changes in BPM before and after therapy also show that music can act as an effective natural intervention in managing stress responses. By listening to calming music, participants were better able to control physiological responses associated with anxiety. A lower heart rate not only reflects reduced stress, but also improved physical well-being, as the body is in a more stable and comfortable state.

This graph as a whole shows that music therapy is effective in reducing heart rate, both in conditions with the lowest and highest BPM values. A decreased heart rate was the main indication that the participant's body shifted from a stressed or anxious state to a more relaxed and stable state after undergoing music therapy. The body's more stable response after therapy sessions suggests that music has the potential to be an effective tool for improving emotional and physiological balance in stressful situations. This decreased heart rate indicated that the participants were no longer in a state of tension or anxiety, but had reached a more calm and comfortable state, where their bodies responded to the music therapy by lowering their BPM levels.

Table 1. Stress levels using the GSR sensor in bits

Condition of Patients	**GSR (bits)**
Normal	0-300
Relax	301-525
Light Stress	526-600
Moderate Stress	601-725
Heavy Stress	726-825
Extremely Stressful	826-1023

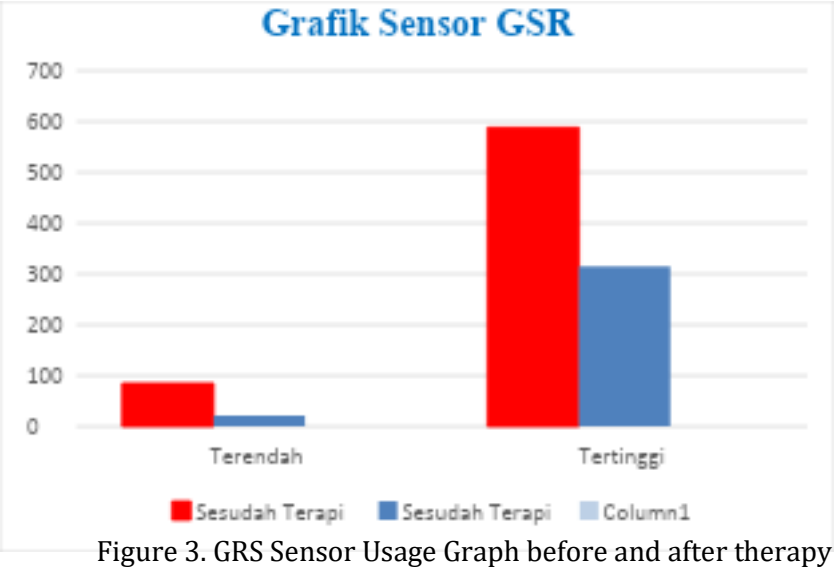

Figure 3. GRS Sensor Usage Graph before and after therapy

The graph above depicts changes in GSR (Galvanic Skin Response) levels in two conditions: before and after therapy. The red color shows the GSR value before therapy,

while the blue color shows the GSR value after therapy. GSR measures skin conductance levels, which are related to sweat activity and serve as an indicator of physiological responses to stress. Increased skin conductance usually indicates increased sympathetic nervous system activity, which occurs when a person feels anxious or stressed.

In the graph, the section showing the Lowest value shows that the GSR before therapy was in the low range, and after therapy, the GSR decreased further. This showed that after therapy, the participants' skin conductance decreased, indicating a calming effect from the therapy. The decrease in GSR to this lowest value shows that therapy has an impact in reducing the physical response to stress, leaving the participant's body in a calmer and more stable condition.

On the other hand, the "Highest" section of the graph shows a significant change in GSR before and after therapy. The highest GSR before therapy was around 588, a high number and indicative of an intense stress condition. However, after following therapy, this number dropped to around 300 , showed a drastic reduction in stress levels as measured through skin conductance. These changes showed that the therapy was effective in reducing stress-related physiological activity, making participants' body responses more manageable.

The significant decrease in the highest GSR illustrates that the participants' nervous system, especially the sympathetic nervous system which is active when stressed, experienced a decrease in activity after therapy. This activity usually decreases when a person feels more relaxed or calm, indicating that the therapy is successful in reducing the anxiety experienced by the participant. The effect of therapy is clearly visible in the comparison of the highest GSR before and after therapy, where the lower numbers after therapy indicate that the participant's body is no longer in a stressed or stressed state as before.

From the difference in GSR in the highest condition, it can be seen that music has a strong influence on the participants' physiological responses. The change from around 588 to 300 after therapy suggests that music helps reduce electrodermal activity commonly triggered by stress. This decrease also illustrates the role of music as an effective medium in calming nerves and reducing physiological responses to psychological stress, which leads to a more comfortable and stable physical condition for participants.

Changes in GSR before and after therapy also illustrate that music has a significant impact in reducing body tension. Conditions before therapy showed that participants experienced high skin conductance activity, indicating anxiety or stress. After the therapy session, the GSR decreased significantly indicating that the participant experienced deep relaxation, so that the body was able to respond more calmly. This response is an indicator that the participant's body has reached a better state of homeostasis after therapy.

By looking at the GSR range between the lowest and highest conditions, this graph illustrates that music therapy not only helps reduce the stress response, but also helps the participant's body achieve a better balance between physiological and psychological conditions.

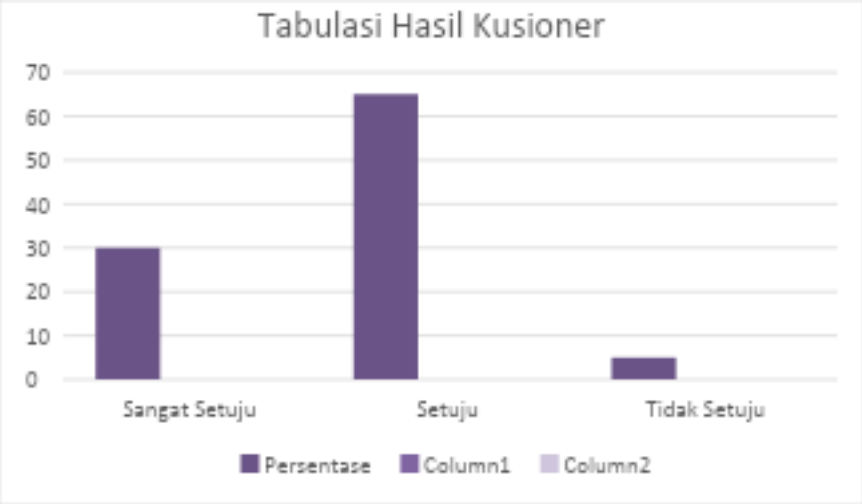

Figure 4. Graph of questionnaire results after listening to therapeutic music

The graph above shows the results of a survey of 28 respondents regarding their perceptions of the use of music therapy as a stress management method, especially in the context of academic activities. There were three response categories: “Strongly Agree” (30%), “Agree” (65%), and “Disagree” (5%). The results of this survey provide insight into the level of acceptability and effectiveness of music therapy according to the experiences of respondents.

Category Agree

The Agree category includes the majority of respondents with 65%, indicating that the majority of them feel that music therapy has had a positive impact in reducing the stress they experience. Respondents in this category may feel the benefits of music in reducing tension and providing calm, but may not feel a tremendous impact. The high percentage in this category shows that for most people, music therapy is quite effective in providing comfort and helping manage the stress of academic life. In general, those who agreed felt that listening to music helped them become more relaxed and increased their focus in carrying out academic activities. This effect may be due to music's ability to stimulate mental relaxation and aid in emotional management. Music has been known to have a psychological impact that can improve mood, thereby helping a person feel better prepared to face everyday challenges. In academic contexts, where pressure is often high, music therapy can serve as a powerful tool for maintaining calm and increasing productivity.

Strongly Agree Category

As many as 30% of respondents stated that they Strongly Agree, indicating that they strongly support the benefits of music therapy in reducing stress. Respondents in this group likely had significant positive experiences with music therapy, allowing them to find it helpful in managing stress. They may find that music helps them achieve a better mental state, increases happiness, and reduces stress significantly.

This category shows the potential that music therapy not only provides general benefits, but also has a deep impact on some individuals. This can be caused by various factors, including the type of music listened to, personal preferences, and emotional conditions before and after listening to music. Respondents who strongly agree may have greater confidence in music as a therapeutic tool and may be more likely to use this therapy long term as a stress management strategy.

Disagree Category

Although the number is small, there are around 5% of respondents who said they "Disagree" with the benefits of music therapy in reducing stress. This shows that there is a minority who feel that music therapy does not really help them in managing stress or feel

that it is not suitable for the music approach as a form of therapy. It is possible that respondents in this category have other preferences for dealing with stress, such as exercise, meditation, or other activities that are more effective for them.
The factors that influence disagreement can vary. Perhaps some of them have musical tastes that do not match the type of music used in therapy or do not feel comfortable with this approach. It is also possible that they have different stress management methods that better suit their needs

CONCLUSION

Research on the effect of music therapy on the stress levels of medical students at HKBP Nommensen University provides in-depth insight into the potential of alternative approaches to stress management in stressful academic environments. Medical students often experience high levels of stress due to intensive study loads, academic demands, and pressure to excel. Therefore, it is important to explore interventions that can help them overcome this stress. This study adopted a box music therapy (BmT) approach, which integrates technology with music to create an effective therapeutic experience. By using heart rate (BPM) and galvanic skin response (GSR) sensors, researchers can measure physiological changes that occur before and after music therapy sessions. The measurement results showed a significant decrease in BPM from 120 before therapy to 100 after, indicating that music therapy was able to provide a real relaxation effect. The decrease in GSR from 588 to 300 also shows a reduction in physical tension that is often experienced by individuals who are under stress. From a qualitative perspective, the questionnaire given to 28 students showed that 65% of respondents agreed that music therapy contributed to reducing stress, while 30% strongly agreed. This shows that the majority of students feel the benefits of music therapy in improving their emotional state. Only 5% felt they were not helped, indicating that this therapy had a significant positive impact for most participants. The music chosen in this therapy also plays an important role. The songs chosen are not only relevant to student preferences but also have a tempo and melody that supports a calm atmosphere. Classical music, pop and soulful songs are carefully selected to create an immersive experience and help students relax their minds more easily. Thus, this approach not only targets the physical aspect, but also provides space for their emotions to be processed better. Overall, this study confirms that music therapy is an effective strategy for managing stress among medical students. The implementation of music therapy in an academic environment can provide significant benefits for students' mental health, as well as improve their quality of life during a tough education. With the right support, music therapy can be part of the mental health curriculum in medical school, which will encourage students to better recognize and deal with stress in healthier and more productive ways.

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