DURMS
Durham Undergraduate
Research in Music & Science

Personal Musical Preferences in Bedtime Routines: Exploring the Use of Music as a Sleep Aid

Amy Gatward
Durham University

ABSTRACT

This study aimed to investigate the impact of the incorporation of music into sleep routines on sleep quality. Using an online survey, this study investigated how people use music in their bedtime routines, not just to aid sleep but also to wind down before getting into bed. While previous research has established the positive impact of listening to music on sleep quality, this study found that those who listened to music did not have higher sleep quality (p=.77). Furthermore, this study explored music beyond traditionally 'sleepy' or ambient music, instead focusing on what and why individuals choose to listen to when they sleep. The results demonstrate a trend between sleep music and musical preference, alongside tempo, instrumentation, and dynamics. Overall, this research adds to the ever-growing investigation into the use of music as an aid for sleep, contributing to an understanding of the relationship between music, individual preference, and sleep routines. It highlights the importance of acknowledging subjectivity, familiarity, and personal preference for tailored optimisation of sleep quality and well-being.

Keywords: music, sleep quality, relaxation, musical preference, familiarity

1. INTRODUCTION

Sleep is a fundamental aspect of human life. It is essential to energy conservation, immune regulation, learning, and memory (Kutty 2012, p.42). Recognising the importance of sleep has led many researchers to explore methods of improving sleep quality. The investigation, then, into music's ability to aid sleep is highly significant. If music can improve sleep quality, it is a far more inexpensive and accessible tool that could significantly impact many people.

Over the past couple of years, there has been an influx of research into using music to aid sleep. Harmat's 2008 study explored the effectiveness of classical music in aiding sleep quality. Using a three-group repeated measures design, their study concluded that listening to classical music improved sleep quality for those with sleep issues.

Cordi's 2019 study built upon these ideas by comparing the effect of listening to music versus audiobooks on participants' sleep quality. They found that music not only improved sleep quality but helped participants to fall asleep quicker. The focus of this study, however, was on midday naps, therefore not establishing the effect that music would have on the REM stage of sleep. In addition, the sample of this study was exclusively women. This lack of diversity creates issues of applicability, not establishing the impact that gender could potentially have on the results.

While these studies establish the effect that classical music had on sleep, Schubert's 2020 study explored the specific features of music that are most effective in aiding sleep. Through a survey and musical analysis, they determined that certain music features impacted the ability to aid sleep. They concluded that dynamic variation, lyrics, and genre did not significantly alter the effectiveness of aiding sleep. However, other features such as legato, low rhythmic activity, and lower main frequency register made the music most suitable for aiding sleep. However, the effect of this was not compared to sleep quality; instead, it investigated music that people were already listening to to help them sleep.

Finally, in 2023, Hu et al. explored the effect of sleep music on sleep quality and mental health. Through the use of sleep logs, questionnaires, and the PSQI, this study concluded that not only does listening to music while sleeping enhance participants' sleep quality, but it also has a significant effect by decreasing anxiety and

depression. Once again, however, this was established in a limited sample, this time in students with poor sleep quality. They also only used sleep ambient music that was only used for 30 minutes, not exploring its use in different routines and musical effectiveness.

These studies demonstrate the effectiveness of music in aiding sleep; however, this topic has only recently been explored, and there are definitely still many gaps in the research. This study aims to explore three clear ones.

Firstly, there is a clear focus on classical music or traditionally "sleepy" or ambient music. This study instead aims to explore what other types of music people listen to to aid their sleep. While Schubert's 2020 study determined that genre was insignificant when establishing good sleep music, the study did not consider the relation this might have to musical preference.

Secondly, these studies explore a limited sample without diversity, focusing on women, students, or those who struggle with sleep. This study, however, aims to explore a broader sample, including participants of a range of age, gender, and musicianship, as well as participants with a range of sleep routines and quality. This diverse sample is to establish a wider significance of music on sleep quality.

Finally, there is a lack of focus on sleep routines. Using a causational design method, these studies are limited to consistent independent variable manipulation. This design does not, then, explore how music can be used in different ways, for example, for different amounts of time or at different stages of the sleep routine.

This study aims to explore three main ideas surrounding music and sleep:

1. The effect of listening to music on sleep quality;
2. How music chosen to aid sleep is linked to musical preference;
3. How and when music is used in bedtime and sleep routines.

This study hypothesised that, as established by Schubert's (2020) and Harmat's (2008) studies, listening to music would have a positive impact on sleep quality. Therefore, those who frequently listen to music in their nighttime routines would have better sleep quality. In addition, while Schubert (2020) established that genre was insignificant to the effectiveness of music in aiding sleep, the hypothesis of this study was that genre preference would be closely linked to the music people listen to when they sleep.

2. DESIGN

To explore these hypotheses, this study utilised an online questionnaire sent out on social media. It aimed to establish an overview of participants' sleep routines and incorporation of music. The questionnaire opened with demographic questions establishing age, gender, and musicianship. Following this, participants were required to fill out the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) to allocate a sleep quality score. Participants were asked to complete the Short Test of Musical Preference (STOMP; Rentfrow & Gosling, 2003) twice, once regarding musical preference and again to indicate how likely they would be to use each genre within their sleep routines. This method was developed to compare each individual's musical preference and music used for sleep. Finally, participants were asked more open-ended questions about using music in their sleep routines. These questions enquired about when they listen to music at nighttime, what music they choose, and its effect on them.

3. RESULTS

The questionnaire received 67 responses from social media, of which 79% were completed, totalling 52 valid participants.

The questionnaire, designed to capture a wide range of perspectives, was sent out with the intention of getting a diverse sample, and it succeeded in doing so, with responses spanning various age groups and musical preferences (as demonstrated in Figure 1). 75% of responses were female, 23% male, and 2% non-binary or third gender. 71% of participants were between the ages of 18 and 24, with a slightly depleted number of responses from other age brackets.

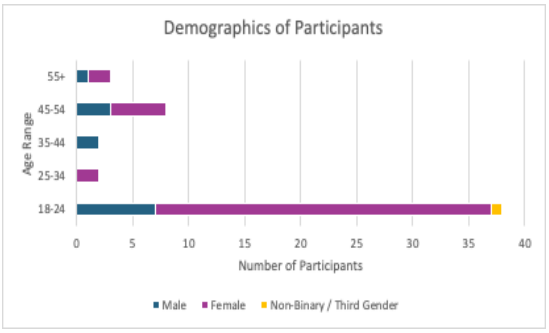

Figure 1. Bar graph showing demographics of participants

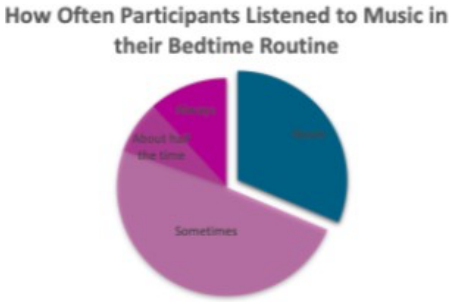

Figure 2. Pie chart showing how often participants listened to music in their bedtime routines

This questionnaire was also aimed at those who did not use music in their sleep routines to explore a comparison between those who did. 31% of participants said they never listened to music in their bedtime routines (see Figure 2). Only 12% of participants said they always listen to music, but 69% participants at least listened sometimes.

The Effect of Listening to Music on Sleep Quality

The first key finding of this study is the lack of correlation between sleep quality and music listening habits. The performance of an ANOVA test between those who listen to music (Sometimes, About half the time, and Always) and those who never do, resulted in $F(1,51)=.08$, $p=.77$. This indicates that there is no significant difference in the PSQI scores of those who listen to music in their sleep routines and those who do not.

Furthermore, we analysed our data using a Spearman's Rank Correlation to assess the links between the frequency Likert scale and PSQI. This resulted in $Rs=.04$ and $p(2\text{ tailed})=.77$. This further emphasises the lack of correlation and significance between participants' PSQI score and how often they listened to music (see Figure 3). There was the most variance in participants who listened to music about half the time in their bedtime routines, $\sigma=2.38$ (see Figure 3).

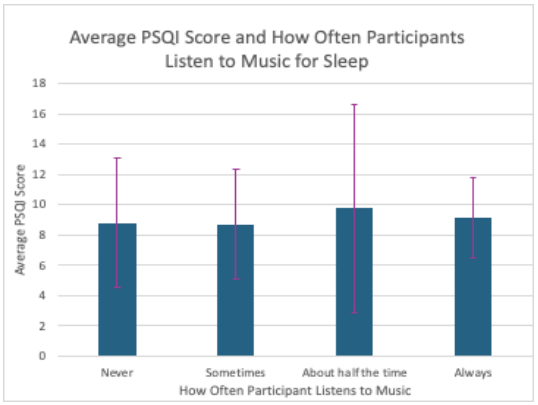

Figure 3. Bar graph showing average PSQI and How Often Participants Listen to Music for Sleep

How Music Chosen to Aid Sleep is Linked to Musical Preference

While the study did not find a direct correlation between music and sleep quality, it did uncover significant findings on musical preference and chosen sleep music (see Figure 4). The application of a Spearman's rank correlation to the average preference and sleep effectiveness scores of each genre resulted in Rs=.70 and p(2 tailed)=.01. This data demonstrates statistical significance and identifies a strong positive correlation between musical preference and the music participants would choose to aid sleep. The average Spearman's correlation of individual musical preference and sleep effectiveness scores was Rs=0.48, p=0.19.

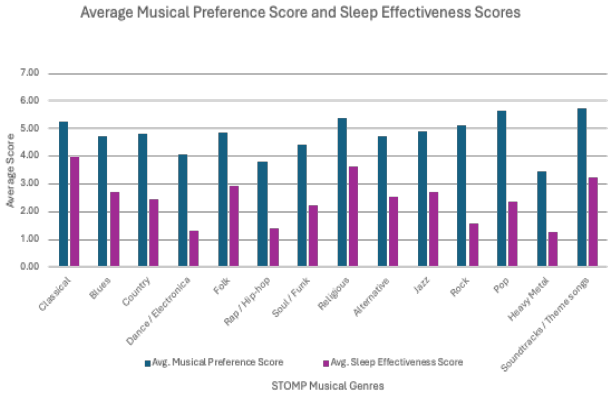

Figure 4. Average musical preference scores and sleep effectiveness scores, by musical genre

Of the genres listed, soundtracks and theme songs had the highest average sleep effectiveness score and heavy metal had the lowest.

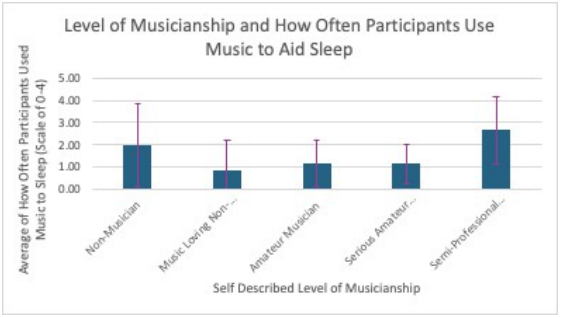

Figure 5. Bar graph showing musicianship and the use of music for sleep

This study found no correlation between levels of musicianship and whether participants used music to aid sleep (see Figure 5). The results of Spearman's rank correlation Rs=.15, p=.29 demonstrate no statistical significance between these variables.

How and When Music is Used in Bedtime and Sleep Routines

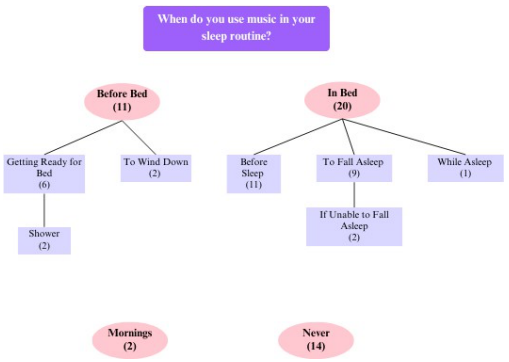

Figure 6. Hierarchy diagram showing when participants use music in their sleep routines

The second part of this study was built upon qualitative data. Regarding when participants used music in their routines, there were four clear categories: before bed, in bed, in the morning, and never (see Figure 6). When these categories were unclear, personal judgement was used to determine them. For example, when participants stated they listened to music 'before sleep,' this was inferred to be while in bed.

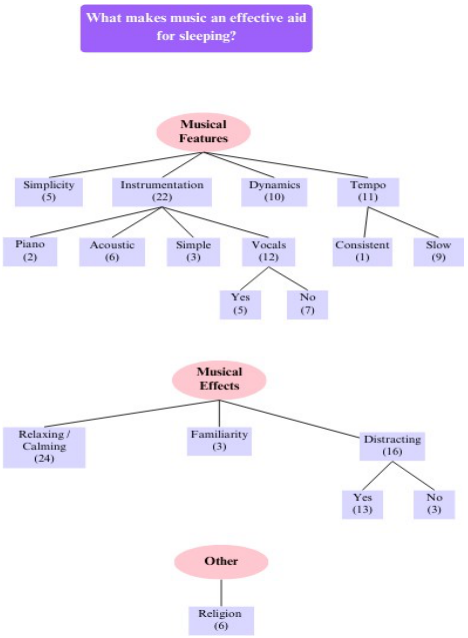

Figure 7. Hierarchy diagram showing how participants defined what made music helpful to aid sleep

The study also delved into how participants select music to aid their sleep. Some participants focused on the music's features, such as the instrumentation, dynamics, and tempo, while others were more concerned with the music's effect on them (see Figure 7). The most frequently mentioned musical feature was instrumentation. Interestingly, of the participants who mentioned vocals, 58% preferred music without vocals, while 42% appreciated the lyrics.

Similarly, within the musical effects, there was a divide on whether the music should be distracting. 25% of participants mentioned how they used music for sleep, as it helped distract them from their thoughts. However, 6% of participants stated that they did not want music to be too distracting if listening when trying to go to sleep. The most common response was relaxation, which was mentioned by 46% of the participants. 11% of participants also mentioned the religious importance of music, claiming this as a reason that they used music to sleep.

4. DISCUSSION

Music and Sleep Quality.

The results of this study showed no correlation between music and sleep quality. However, this lack of correlation between those who listen to music and sleep quality does not necessarily contradict the results of Harmat et al. 2008 or Schubert et al. 2020. This study did not establish a personal control and measure the effect of adding music to sleep routines on participants' sleep quality. Instead, this study compared the sleep quality of those who listen to music and those who do not. Sleep quality is so individual and based on many different lifestyle and exterior factors that comparing between subjects is insignificant. It cannot be compared between people but must be approached from a personal standard and comparison. Therefore, the lack of correlation should be expected as it is a between-participant study rather than an intra-participant design.

Harmat's (2008) and Schubert's (2020) studies established the *improvement* that music can have on sleep quality. This study demonstrates that while music may improve sleep quality, it does not directly correlate to attaining a high sleep quality score.

Perhaps it would be interesting to explore a method similar to Harmat's 2008 study but with those who do not have issues with sleeping. This method would investigate the ability that music might have to not just help those with poor sleep but to prevent it. The data from this study seems to indicate that music is not as effective as a preventative measure as a reactive one, for those who listen to music regularly to sleep do not necessarily have better sleep quality.

However, this study did not explore how long participants had been listening to music to aid sleep, nor what their sleep quality may have been before that. In addition, other factors may affect participants' sleep quality scores. For example, some participants expressed that stress, travel, or work had negatively impacted their sleep schedules in the past three months. These factors would suggest a discrepancy in their PSQI score unrelated to their use of music.

In summary, this study did not demonstrate a correlation between those who listen to music while sleeping and those with a higher PSQI score.

Music Preference and Music for Sleep.

The results of this study demonstrate a clear link between musical preference and the music people choose to listen to in order to aid their sleep. Schubert's 2020 study established that genre had little impact on the sleep music people choose. However, this makes sense as there would not necessarily be consistency as musical preference is not consistent.

In addition, some participants noted that they would choose music they were familiar with to aid their sleep. Familiarity stems from musical preference but is also significant for helping aid relaxation (Pereira et al. 2011; Tan et al. 2012). There may be some exceptions to this with regard to sleep, which links to Schubert's establishing of musical features that aid sleep in their 2020 study. For example, suppose someone's favourite genre is heavy metal with aggressive sound, distorted instruments, and driving rhythms. In that case, it might be less likely to be conducive to helping relax the mind in preparation for sleep. However, musical preference

is significant in aiding familiarity and relaxation. Even in this scenario, the heavy metal genre, if chosen by the individual, could help aid them to relax, and furthermore, to sleep. It demonstrates that music that aids sleep does not have to be traditionally ambient or classical, as this may not be someone's preference. Instead, when choosing sleep music, familiarity must also be considered, as well as the specific musical features of the music.

Further investigation could be established regarding this. Designing a method that directly compares listening to familiar music and music that is not and comparing this to participants' sleep quality would investigate how much familiarity with music is essential. Furthermore, establishing a larger sample and ensuring a wider diversity of musical preference would further explore how familiarity affects sleep effectiveness score. For example, this study did not seem to include many heavy metal or dance music fans as these scored lowest on the average musical preferences test. These genres particularly are also maybe least likely to be used to aid sleep, therefore further investigation into this might reveal the limitations of familiarity and preference.

However, these ideas should also be considered regarding what people want from music to help them sleep. Many participants also stated that they used music to distract them from their thoughts. Some, however, did not want music to be distracting; instead, they wanted it to drown out other noises. The difficulty with prescribing a one-size-fits-all solution is that it is entirely subjective at multiple levels. This study demonstrates the different reasons people listen to music, which determine what they choose to listen to. Not only is familiarity subjective, but the desire for familiarity could be, too.

In summary, while there are issues of subjectivity, this study has demonstrated that sleep music is related to musical preference. In general, people choose music they enjoy listening to when they go to sleep, as this relaxes and distracts them.

Musicianship and Use of Music for Sleep.

Contrary to the hypothesis, this study found no clear trend between the level of musicianship and whether participants listened to music. This suggests other factors influence individuals' sleep routines and music listening habits.

Music and Sleep Routines.

The use of music in participants' sleep routines was not exclusive to listening to get to sleep. Many described using music in their routines to get ready for bed and using music while in bed to fall asleep. These responses demonstrate the use of music, not just while trying to sleep. This study aimed to collate data on when people use music in their sleep routines. However, this also demonstrates a gap in research. Previous studies into using music and sleep have focused on listening to music while trying to fall asleep. However, further research could be undertaken on the effect that listening to music before bed has on sleep and, indeed, how this would compare to listening while trying to fall asleep.

Other participants also mentioned the use of music in their morning routines. While this was not the focus of this study, it would be interesting to explore how this might also affect sleep or energy levels throughout the day.

Furthermore, some participants mentioned listening to music if they could not fall asleep. This enforces Harmat's 2008 conclusions that music could be used to aid those who had sleep issues. However, this also demonstrates that these people recognise that music can be used as aa tool to aid sleep. The fact that these participants only used it when they were struggling to sleep enforces the idea that music is perhaps better suited as a reactionary measure to sleep problems than a preventative one.

Some answers to questions surrounding when and why participants used music to sleep could have been clearer. If this project were undertaken again, interviews could be held to clarify and collect more detail.

Furthermore, exploring participants' sleep routines over time would be interesting. As established, some only listened to music when they could not sleep, while some listened to music every night. One participant stated that they repeatedly listened to the same music every night to establish a routine. This generates a Pavlovian response by instinctively training the brain to associate sleep with certain music. Further study into long-term sleep routines would be particularly revealing in establishing whether this response would eventually be achieved or if the long-term effect of music would plateau and become ineffective.

In summary, the use of music in sleep routines is not limited to while in bed. Indeed, music can be included in any part of the evening routine. This effect could be further explored as studies mainly focus on listening to music while in bed.

Sleep Music

As already established, familiarity is important when choosing music to sleep to. The subjectivity of this, then, resulted in a great variety of music. From James Blunt to Jean Michel Jarre and Guvna B to show tunes, there was an eclectic mix of tunes on participants' sleep playlists.

Other than familiarity, participants noted tempo, instrumentation, and dynamics as factors when choosing sleep music. With regard to these features, participants often noted simplicity and continuity.

The idea of simplicity reinforces Schubert's 2020 findings that high rhythmic activity, including complex patterns, polyrhythms, and syncopation, was not conducive to good sleep music. However, their study found that tempo was insignificant to successful sleep music. However, multiple participants in this study brought up the tempo as a feature that they consider important to help them sleep.

Another element that is interesting to note is the high proportion of participants that brought up lyrics. Perhaps surprisingly, there was a relatively even split between those who expressed vocals had a positive reaction to their sleep and those who had a negative one. This relates to the subjectivity of requirements from sleep music. For those who want to be distracted from their thoughts, lyrics might be helpful. In addition, hearing lyrics that say certain things might help some participants relax. For others, however, lyrics may be distracting in the wrong way and hinder their sleep rather than aid it. This discrepancy emphasises subjectivity and challenges the notion of traditionally 'sleepy' and ambient music employed by previous studies (Harmat 2008; Hu 2023).

However, often, the participants who mentioned that they used music with lyrics would be listening to this before bed instead of while trying to sleep. The primary differentiation when asked about music used before bed or while in bed was the presence of lyrics and not. Non-vocal music has lower arousal, which would be more suitable for listening to while in bed (Scarratt 2023); however, vocal music can also, in some cases, be helpful in sleep induction (Lee 2019). Further study into the music used at different stages of sleep routines and the use of lyrics in sleep music would be fascinating.

In summary, other than familiarity, participants noted tempo, instrumentation, and dynamics as factors to consider when choosing sleep music. However, there are slightly different considerations for music listening at different stages of the music routine.

5. LIMITATIONS

As partially discussed throughout, this study has several limitations. Firstly, there is a case for exploring a between-participant design rather than a within-participant that raises issues of subjectivity.

The method used was effective in reaching lots of people; however, in some cases, an interview could have been more suitable. Some clarifications would have been helpful. In addition, there are always concerns when participants are asked for self-assessment as it allows for potential bias or inaccuracies. This is especially true as participants completed the survey retrospectively when determining their sleep quality scores. This could be mitigated by asking participants in advance and asking them to keep a sleep diary, which would be more

accurate.

Finally, sleep quality is so subjective and impacted by so many different things that it is difficult to establish a representative score. Some participants stated that their response came amidst deadlines, illness, or other reasons as to why their sleep quality might be affected. This could have impacted the results of the correlations between sleep quality and listening to music.

6. CONCLUSIONS

In conclusion, this study demonstrates that listening to music does not necessarily equate to the attainment of a high sleep quality score. However, sleep quality can be impacted by so many other factors and circumstances that perhaps this is to be expected.

Secondly, this study shows the close link between music people choose to help them sleep and music preference. Relaxation can come from familiarity, therefore preparing the mind to wind down for bed.

Finally, this study demonstrates the variety of music and uses of music used within sleep routines. It does not just have to be used while trying to sleep, but can also be used in the evening routine while getting ready for bed.

Research into music and sleep is still only in the very early stages and there is a lot more to discover. More research into the effect and use of music to aid sleep, as well as generating awareness could be vastly beneficial to many people's lives.

REFERENCES

Buysse, D. J., et al.. (1989). 'The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research'. *Psychiatry Res.* 28(2), 193-213.

Cordi, M. J., Ackermann, S., and Rasch, Björn. (2019). 'Effects of Relaxing Music on Healthy Sleep'. *PubMed Central,* 9 (9079).

De Niet, G. et al.. (2009). 'Music-assisted relaxation to improve sleep quality: meta-analysis'. *Journal of Advanced Nursing,* 65(7), 1356-1364. Dickson, G. T., and Schubert, E. (2022). 'Musical features that aid sleep'. *Musicae Scientiae*, 26(3), 497-515.

Dickinson, G. T., and Schubert, E. (2020). ' Music on Prescription to Aid Sleep Quality: A Literature Review'. *Frontiers in Psychology.* 11.

Harmat, L., Takás, J., and Bodizs, R. (2008). 'Music improves sleep quality in students'. *Journal of Advanced Nursing,* 62(3), 327-35.

Hernandez-Ruis, E. (2005). 'Effect of Music Therapy on the Anxiety Levels and Sleep Patterns of Abused Women in Shelters'. *Journal of Music Therapy.* 42(2), 140-58.

Hu, Shun-Ping, Yang, Ya Meng et al. (2023). 'Effect of sleep ambient music on sleep quality and mental health in college students: a self-controlled study'. *Frontiers in Psychology,* 14.

Lee, Taekyu, Seong-Eun Moon, Jongsoo Baek, Jong-Seok Lee, and Songkuk Kim. "Music for Sleep and Wake-Up: An Empirical Study." *IEEE Access* 7 (2019): 145816–28. https://doi.org/10.1109/access.2019.2945404.

Tan, X., C. J. Yowler, D. M. Super, and R. B. Fratianne. "The Interplay of Preference, Familiarity and Psychophysical Properties in Defining Relaxation Music." *Journal of Music Therapy* 49, no. 2 (June 1, 2012): 150–79. https://doi.org/10.1093/jmt/49.2.150.

Rentfrow, P. J., & Gosling, S. D. (2003). 'The do re mi's of everyday life: The structure and personality correlates of music preferences'. *Journal of Personality and Social Psychology, 84,* 1236-1256.

Scarratt, Rebecca Jane, Ole Adrian Heggli, Peter Vuust, and Makiko Sadakata. “Music That Is Used While Studying and Music That Is Used for Sleep Share Similar Musical Features, Genres and Subgroups.” *Scientific Reports* 13, no. 1 (March 23, 2023). https://doi.org/10.1038/s41598-023-31692-8.

Schubert, Emery, and Dickinson, Gaelen Thomas (2019). ‘Music on Prescription to Aid Sleep Quality: A Literature Review’
Front. Psychol., 28 July 2020, 11.

Tan, X., C. J. Yowler, D. M. Super, and R. B. Fratianne. “The Interplay of Preference, Familiarity and Psychophysical Properties in Defining Relaxation Music.” *Journal of Music Therapy* 49, no. 2 (June 1, 2012): 150–79.

Wang, Qun, Sek Ying Chair, Eliza Mi Ling Wong, and Xiaomei Li. “The Effects of Music Intervention on Sleep Quality in Community-Dwelling Elderly.” *The Journal of Alternative and Complementary Medicine* 22, no. 7 (July 2016): 576–84. https://doi.org/10.1089/acm.2015.0304

Zhang, J. D., & Schubert, E. (2019). 'A Single Item Measure for Identifying Musician and Nonmusician Categories Based on Measures of Musical Sophistication'. *Music Perception*, *36*(5), 457–467.

APPENDIX

Questions asked in survey:

1. What is your age? 18-24, 25-34, 35-44, 45-54, 55+
2. What is your gender? Male, Female, Non-binary / third gender, prefer not to say
3. What is your level of musicianship? Non-musician, Music loving non-musician, Amateur musician, Serious amateur musician, Semi-professional musician, Professional musician
4. What instruments do you play?
5. STOMP: https://gosling.psy.utexas.edu/wp-content/uploads/2014/09/stomp.pdf
6. PSQI: https://www.goodmedicine.org.uk/files/assessment,%20pittsburgh%20psqi.pdf
7. Are there any reasons for an abnormal change in your sleep routines over the past month?
8. Do you use music in your bedtime routine, either before bed to wind down or to help you sleep?
9. When do you listen to music in your bedtime routine?
10. Why do you use music in your bedtime routine?
11. What music helps you wind down for bed or do you think might help you wind down for bed? Please give examples.
12. What music helps you sleep or do you think might help you to sleep? Please give examples.
13. What about this music helps (or do you think would help) you sleep / wind down for bed? Please describe the specific features that you think aid in sleep / relaxing.
14. For the following musical genres please state how effective you think they would be in aiding your sleep on a scale of 1-5 (STOMP musical genres):

    a. Blues
    b. Classical
    c. Country
    d. Dance / Electronic
    e. Folk
    f. Rap / Hip-hop
    g. Soul / Funk
    h. Religious
    i. Alternative
    j. Jazz
    k. Rock
    l. Pop
    m. Heavy metal
    n. Soundtracks / Theme songs