## Background Music's Impact on Patients Waiting in Surgery and Radiology Clinics.

Background music is ubiquitous and its use in commercial settings has been studied extensively. Over the past two decades, the use of music in various healthcare settings has increased both as a deliberate intervention and as a form of background music. Realizing music's role in the context of healthcare has led to a variety of research interventions (see Spence, 2021, for a review). Specifically, background music has been shown to reduce the anxiety of patients while they wait for treatment (Chen et al., 2013; DeMarco et al., 2012; Ventura et al., 2012), and can also result in a more positive evaluation of the healthcare environment (Silverman et al., 2012; see Spence & Keller, 2019, for a review). Despite the optimism displayed by researchers in previous studies, evidence documenting the successful use of background music in waiting rooms as an intervention has, thus far, been inconclusive (Lai & Amaladoss, 2022).

### Music and Anxiety

Anxiety is oftentimes a familiar and unpleasant experience among patients awaiting treatment. Patients exhibit both psychological and physical effects that can be characterized by an increase in heart rate, blood pressure, and respiratory rate (Chen et al., 2013; Kipnis et al., 2016; Riberio et al., 2018; Ventura et al., 2012;). Feelings of fear, uncertainty, and pressure can cause great uneasiness both mentally and physically, and understanding the conditions in which music can mediate this phenomena can potentially lead to a more positive experience overall (Vaughan & Bosworth, 2007). Consequently, a growing number of studies have demonstrated the potentially beneficial influence of music in terms of easing anxiety and reducing pain (Fenko & Loock, 2014; Kipnis et al., 2016; Schäfer et al., 2013). In fact, in some instances, music has actually been shown to result in a reduction in the need for painkillers (Comeaux and Steele-Moses, 2013; Chanda & Levitin, 2013; Trappe, 2012).

One of the earliest studies concerning the deliberate use of music in waiting rooms was conducted by Routhieaux and Tansik (1997). The authors claimed that those waiting for loved ones during surgical procedures reported being more relaxed and had a decreased level of self-reported stress when listening to Western classical music as compared to when no music was presented. However it is unclear which specific pieces of Western classical music were used in this study which itself was conducted in the West. Other studies, meanwhile, have demonstrated that music has stress-reducing effects irrespective of genre, self-selection of music, or duration of music although a majority of studies used Western classical music (Finn & Fancourt, 2018; Kipnis et al., 2016; Silverman & Hallberg, 2015). Trappe (2012) reported that classical and meditative music produced the most beneficial effects on health for intensive care patients as compared to heavy metal or techno music.

Western classical music has also been used to help lower the anxiety of children waiting in a pediatric emergency room (Holm & Fitzmaurice, 2008; Panda et al., 2015). It is, however, important to note that despite a great wealth of literature supporting the use of Western classical music to reduce anxiety, a significant body of research also contradicts such findings. For instance, Jones and Brittain (2009) found that although classical music was preferred, written comments from participants and staff were overwhelmingly negative. Furthermore, the playing of music was found to have no effect on self-reported anxiety, relative to a no music baseline. Along similar lines, Waldon and Thom (2015) examined the effects of recorded music on adults in an outpatient mental health clinic and found no differences in anxiety between the music group and the no music group (see also Jarred, 2003). Factors such as age, as well as social, and cultural norms may well modulate the effects of music (be they positive or negative) on anxiety (e.g., Taylor-Piliae & Chair, 2002). It is easy to imagine how different groups of individuals might find different kinds of music either more liked and/or more relaxing (Forsyth & Cloonan, 2008).

**Music and the Perception of Healthcare Services**

In recent years, there has been a gradual increase in the number of studies investigating how music can be used to influence perception of waiting rooms in a hospital. Generally-speaking, researchers have found that music in waiting rooms can be positively associated with a decrease in anxiety, albeit without a concomitant effect on patient satisfaction (Brandt et al., 2013; Höller et al., 2012; Ventura et al., 2012). Iyendo (2016) noted that crafting a soundscape of soft wind, twittering birds, and ocean sounds elicited positive emotions and feelings in patients when contrasted with exposure to hospital noises. Iyendo argued that sounds of nature offered the opportunity to improve the hospital experience for both patients and nurses. It is, however, important to note that music preferences may differ between patients and staff, and have been documented to give rise to mixed effects (Liu & Tan, 2000; Mackrill et al., 2013).

According to the results of a study by Silverman et al. (2012), patients in a waiting room that had music playing reported being more satisfied than those patients who were waiting in the no music control condition. The participants were questioned regarding their perception of the time they had been waiting, the cleanliness of the facility, and the overall care provided by the clinic, among other questions. In a follow-up study, Silverman (2015) suggested that live music rather than no music resulted in positive perceptions of the waiting rooms, distracting from potentially stressful appointments (though there are likely to be both practical and financial constraints associated with the use of live music). Similarly, Dijkstra (2009) reported that playing classical music in a waiting area of a dental clinic reduced anxiety and stress as compared to a no music condition. Nevertheless, a differing view was put forward by Tansik and Routhieaux (1999) whereby the researchers suggested that Western classical music did not affect visitors' perceptions and evaluations of the service

quality provided by the hospitals, although it did elevate mood states. Instrumental music that also contained some nature sounds was considered more pleasant and relaxing than Western classical music (Fenko & Loock, 2014).

Previous studies have shown that music that 'fits' the product and brand in question is able to enhance the image and perceptions of the brand (Baker et al., 1994; Grewal et al., 2003; Yeoh & North, 2013). However, it is important to note that not all classical music will necessarily have the same consequences. For example, North et al., (1999) found that supermarket customers were more likely to buy French wines than German wines when French music was played in the background, and likewise far more German wines when German music was played. In a similar vein, Yeoh and North (2009) investigated the impact of musical fit amongst Malaysian consumers of different ethnic backgrounds on product choice. When ethnically Chinese participants were presented with a Malay or Indian version of the product, biased product choices corresponded with the ethnicity of the background music played. Music, in essence is a cultural product and has cultural connotations attached (Zellner et al., 2017). These connotations and semantic associations may differ for different groups of listeners.

**Rationale for the Present Study**

Despite the overwhelming positive responses to the use of music in healthcare settings (see Spence & Keller, 2019, for a review), there have been three presumptions to the current body of literature. Although the use of music has been widely investigated in healthcare settings, the ethnic and cultural background of the participants is not always clear. For example, music that is used in one culture may not produce the same effect in another (see North et al., 1999; Yeoh & North, 2010). In Yeoh and North's study, the authors investigated the impact of musical fit amongst Malaysian consumers of different ethnic backgrounds on

their food choices. Food choices were found to corresponded with the ethnicity of the background music that was played. **The choice of instrumental music, usually Western classical music, has been an especially well-studied option, although this could represent a cultural bias.** Previously too, much of research relating to music psychology have been conducted on western, educated, industrialized, rich and democratic (WEIRD) psychology students from North American universities. Assumptions on behaviour in one people group cannot be generalized to another, especially in fundamental aspects of psychology, motivation and behavior (Henrich et al., 2010a, b). Hence, this study was designed to examine if Western classical music would have the same effect in the West as it would in Asia.

The majority of the studies that have been published to date have recruited participants from one clinic only, and even when studies have been conducted in one specific clinic, there was no clear indication of the consistency of healthcare service provided during the waiting period, and prior to entering the doctor's clinic. Moreover, a patient awaiting a surgical intervention may be expected to be more anxious, and might perhaps respond differently to music from another who is merely awaiting routine consultation or checkup. For instance, Hyde et al. (1998) found that patients awaiting surgery indicated a reduction in anxiety when music was played, albeit the type of music was not specified (see also Brandt et al., 2013; Kipnis et al., 2016). However, Waldon and Thom (2015) found no change in anxiety when music was played in a mental health waiting room. Hence, the purpose of the present study was to measure patients' anxiety in two different clinics, and to have the same healthcare professional administering the test in both clinics.

One other factor to stress is that previous research has made little attempt to blind participants to the experimental condition under study. In studies concerning active therapeutic listening (i.e., engaging in music therapy with trained music therapists; Thaut &

Wheeler, 2010), it is usually ethically binding for the researchers involved to inform participants on the purpose of the study. However, since the current study required only passive listening, blinding participants to the presence of the experimental variable (i.e., music) was easily accomplished. In order to disguise the actual purpose of this study, participants were told that *Hospital Pengajar Universiti Putra Malaysia* (HPUPM) was conducting a survey on customer satisfaction concerning the hospital.

## Methods

### Participants

Ethical approval was granted by the Ethics Committee of Universiti Putra Malaysia (Submission reference: JKEUPM-2021-742; dated 07/02/2022). The sample size was determined by G* Power Software (Statistical power: 80%; Estimated effect size: 0.4; Alpha level: 0.05), which was calculated to be 45 in each group. Participants were required to sign a consent form which stated that the purpose of the study was to understand how the hospital would be able to improve their services, and that participation was voluntary and that they were allowed to withdraw at any time without penalty. It was also noted on this page that the participant's identity would remain confidential in the event of the study results being published. This was a single-blind randomised study in which a total of 303 participants were recruited from both surgery and radiology clinics of HPUPM using a between-groups experimental design. The two clinics are located on different floors of the same hospital and both have overhead speakers situated in the waiting areas. Music was played in the background even when any announcements and alerts were being made. One hundred and fifty responses were collected from the surgery clinic, and 153 responses from the radiology clinic. Of the 150 responses from the surgery clinic, 48 participants listened to background lo-fi music while waiting to see a health professional; the second group of 50 participants

listened to background classical music; while for the third group of 52 participants there was no music playing. Lo-fi music, also known as low-fidelity, is a subgenre of instrumental electronic music, originating from ambient house and chillout music. These tracks use looped samples and mellow hip-hop rhythms to evoke feelings of relaxation, calmness, and nostalgia; with millions of plays on platforms such as Spotify and Apple Music (Criscuolo, 2022). Western classical music is loosely defined as pieces of music composed by Western composers from the 1600s to the early 1900s (e.g. Bach, Mozart, and Beethoven). A similar design was used for radiology patients resulting in 52 participants listening to the lo-fi music in the background, 49 participants listening to classical music, and for the remaining 52 participants there was no music playing. The inclusion criteria required participants to be 18 years of age or older, willing to answer four pages of questions, and were fluent in both written and spoken English. Anyone who was in severe pain, unable to read and understand English, and/or had a hearing impairment was excluded from taking part in the study. Participants who were listening or watching any form of entertainment on their mobile devices with an ear piece were not invited to take part. The mean age of the participants was 37.61 years (*SD* = 12.81). The participants consisted of patients waiting to see their respective medical professionals at HPUPM. Testing was conducted on alternate weekdays, between 10am and 1pm from May to November, 2022. The time chosen reflected the busiest times at the respective clinics.

***Pilot study***

A pilot study was conducted to ensure that the music that was used in the main experiment was clearly identifiable as either Western classical or lo-fi music by a sample of 20 participants drawn from the same general population as the sample used in the main study. Each participant heard a sample of songs from a YouTube playlist of Western classical music

and lo-fi music. They were asked to discriminate between the two alternatives. All of the participants were able to distinguish between the pieces of music. Overhead loudspeakers attached to both surgery and radiology clinics were tested to determine the appropriate volume. An average of 56-60dB was considered comfortable, while not interfering with conversations between staff and patients. Waiting times in both clinics recorded an average of 60 minutes from the time patients registered at their respective clinic counters.

**Materials and Design**

Either Western classical, lo-fi music, or no music was presented in the background. The Western classical music was downloaded from YouTube (Halindonmusic, 2020) while the lo-fi music was downloaded from YouTube (Chillhop Music, 2019). Both music selections were looped for 6 hours at an average of 56-60dB, and were played every day of the week, alternating between weeks. For example, Western classical music would be played in weeks 1 and 3 of the month, while lo-fi music was played in weeks 2 and 4. The Western classical music comprised of string chamber and orchestral music from Mozart, Debussy, Grieg amongst others and averaged at 60bpm. This music had harmonic and dynamic variations, and differing instrumental timbres. The lo-fi music had light straightforward beats, and ambient sounds that were harmonically simple, dynamically compressed and repetitive, with an average of 82bpm.

**Procedure**

The participants in both surgery and radiology clinics were personally approached by a health worker after registering at the respective clinic counter, and being seated for at least 20 minutes. To mask the purpose of the study, the participants were informed by the health worker that the hospital was conducting a survey on customer satisfaction; with no mention

made of music. The health worker collected the forms immediately upon completion. Participants were exposed to the music playing for at least 20 minutes prior to being approached to fill-in the questionnaire. Those who agreed to take part in the study were then given a pen and a 4-page questionnaire to complete. The first page consisted of a consent form. The second page consisted of a shortened 6-item State Trait Anxiety Inventory (STAI-6) questionnaire asking participants to evaluate how they felt at that moment. The STAI-6 questionnaire has good internal reliability (Cronbach alpha 0.82) and the correlation with the full STAI is high ($r$ = 0.95) (Court et al., 2010; Marteau & Bekker, 1992). The shortened scale has been used in many healthcare settings, including dental (Dailey et al., 2002; Humphris et al., 2006), and general medical practice (Court et al., 2010; Rice et al., 2008; Park et al., 2008). The STAI-6 tool consists of six questions with a Likert scale from 1 to 4. This generates a score ranging from 6 to 24. To ensure compatibility with the original STAI-S scores, the STAI-6 score is then divided by 6 and multiplied by 20, delivering a range from 20 to 80. STAI-6 scores are commonly classified as "no or low anxiety" (20-37), "moderate anxiety" (38-44), and "high anxiety" (45-80).

The third and fourth pages required participants to fill in their demographic details; and to ‘X’ the appropriate responses to the following questions. The first five questions required the participants to rate their satisfaction with the level of courtesy and respect, professionalism, care, helpfulness and overall excellence shown by staff at HPUPM. A 5-point Likert scale was used with 1 = very satisfied to 5 = very unsatisfied. The words used to determine satisfaction were obtained from HPUPM’s website which highlights the hospital’s aims and objectives in terms of providing quality care, professionalism, and excellence. Question 6 required the participants to compare the fee at HPUPM to that of other semi-private hospitals, with 1 = very high to 5 = very low. Question 7 asked participants to rate how satisfied they were with their waiting time, with 1 = ‘very satisfied’ to 5 = ‘very

unsatisfied'. Question 8 asked participants how likely they were to recommend HPUPM to their family, friends, and colleagues, ranging from 1 = 'very likely' to 5 = 'very unlikely'. The next two questions required the participants to report whether they enjoyed listening to music and how often they listened to it, ranging from more than 8 hours daily to less than an hour a day. Finally, to ensure that music was heard throughout, a question asking if participants could hear music playing as they were waiting was inserted at the end of the questionnaire for the music groups. The questionnaire took 5-7 minutes to complete.

## Results and Discussion

Data was collected from a total of 303 patients (172 males and 131 females). The mean age of participants was 37.6 years (*SD* = 12.81). The questionnaire (without the 6-item STAI) gave rise to a Cronbach's alpha of 0.88.

### Surgery

There was a statistically significant difference between groups as determined by a one-way ANOVA ($F(2,147) = 24.33$, $p < .001$, $\eta^2 = 0.249$). Those participants who listened to classical music in the background had a mean anxiety of 49.93 on their STAI scores, while those who had listened to lo-fi music had a mean score of 48.13, and participants in the no music condition had a mean of 39.03 (see Table 1). According to the STAI-6 scoring chart, those participants who had classical or lo-fi music playing in the background demonstrated a high level of anxiety, while those participants who had no music playing demonstrated a moderate level of anxiety.

(Place Table 1 approximately here)

Next, a one-way ANOVA was conducted in order to determine participants' perception of the services provided by HPUPM (courtesy and respect, professionalism, care, helpfulness, and overall excellence). The results indicated a significant main effect ($F(2, 147) = 29.07$, $p<.001$, $\eta^2 = 0.290$). In particular, those participants who heard lo-fi music playing rated their overall perception with a mean of 11.96, while those participants who had classical music playing rated at a mean of 11.88. Meanwhile participants who had no music playing rated their overall perception with a mean of 8.34 (see Table 1). A Tukey post hoc test revealed that perceptions of service provided by HPUPM was statistically significant ($p <.001$) when no music was playing, as compared to when classical and lo-fi music was playing. More simply, participants who had no music playing rated their perception for services provided by HPUPM most positively.

To further support the above-mentioned conclusions, one-way ANOVAs were conducted on the remaining three peripheral questions. The results were significant when participants were asked to compare the fee between HPUPM and other semi-private hospitals ($F(2, 147) = 7.37$, $p<.001$, $\eta^2 = 0.091$); when they were asked if they would recommend HPUPM to family members, friends, and colleagues ($F(2, 147) = 12.24$, $p<.001$, $\eta^2 = 0.143$); and if they were satisfied with the amount of time that they had had to wait ($F2, 147) = 15.11$, $p<.001$, $\eta^2 = 0.171$).

Participants who had no music playing rated the fee that they were paying as being lower at HPUPM as compared to other semi-private hospitals (Mean = 3.00), followed by participants who had lo-fi music playing (Mean = 2.71), and classical music (Mean = 2.46; note that the item was reverse-coded). When participants were asked whether they would recommend HPUPM to family members, friends, and colleagues, those participants who had no music playing rated this most highly at a mean of 1.83, followed by participants who had lo-fi and classical music playing at a mean of 2.21 and 2.50, respectively. Similarly when

participants were asked about their satisfaction with the waiting time, the participants in the no music condition were most positive (mean of 2.40); followed by participants who had classical and lo-fi music playing at a mean of 2.46 and 3.23, respectively. In summary, those participants who did not hear any music playing responded most favorably to all three questions (e.g., when they were asked on the fee charged by HPUPM, if they would recommend HPUPM to family, friends, and colleagues, and on their waiting time). Meanwhile, those participants who heard classical music playing in the background responded least positively to all three questions.

**Radiology**

There was a statistically significant difference between groups as determined by a one-way ANOVA ($F(2,150) = 24.48$, $p < .01$, $\eta^2 = 0.246$). Once again, those patients in the classical music condition had the highest anxiety level with a mean of 46.87, while participants in the lo-fi music condition had a mean of 41.67. Meanwhile, the participants in the no music condition had a mean of 35.38 (see Table 2). According to the STAI-6 scoring chart, the participants who listened to background classical music demonstrated a high level of anxiety, participants with lo-fi music demonstrated a moderate level of anxiety and participants who had no music playing demonstrated low anxiety.

(Place Table 2 approximately here)

A one-way ANOVA was conducted to determine participants' perceptions (courtesy and respect, professionalism, care, helpfulness, and overall excellence) for the services provided by HPUPM. The results indicated a significant main effect ($F(2, 150) = 17.30$, $p < .001$, $\eta^2 = 0.195$). In particular, participants who did not hear any background music

playing rated their overall perception of the hospital with a mean of 7.94, while participants who had classical and lo-fi music playing in the background rated their overall perception with a mean of 10.63 and 10.71, respectively (see Table 2). A Tukey post hoc test revealed that perceptions for service provided by HPUPM was statistically significant ($p < .001$) when no music was playing, as compared to when classical and lo-fi music was playing. In other words, those participants who had no music playing rated their perception for services provided by HPUPM most positively.

To further support the above-mentioned results, one-way ANOVA tests were conducted on the remaining three peripheral questions. The results were not significant ($F(2, 150) = 2.46$, $p = .089$, $\eta^2 = 0.032$) when participants were asked to compare the fee they had to pay at HPUPM with other semi-private hospitals. However, there were statistically significant results (note that item was reverse coded) when participants were asked how likely they would recommend HPUPM to their family members, friends, and colleagues ($F(2, 150) = 6.34$, $p = .002$, $\eta^2 = 0.078$). Participants in the no music condition rated their willingness to recommend HPUPM to their family, friends, and colleagues most highly (Mean = 1.75), followed by participants who had lo-fi ((Mean = 2.08) and classical music playing (Mean = 2.29). Similarly when participants were asked how satisfied they were with their waiting time ($F(2, 150) = 5.12$, $p = .007$, $\eta^2 = 0.064$), participants who had no music playing rated their waiting time most positively with a mean of 2.23; followed by participants who were exposed to lo-fi and classical music with a mean of 2.60 and 2.73, respectively. In summary, participants who had no music playing were most willing to recommend HPUPM to their family, friends and colleagues, and were more found to be most satisfied with their waiting time. The participants who heard classical music playing in the background rated lowest on both questions.

## Conclusions

The results of the study reported here provide clear evidence that playing background Western classical music failed to reduce anxiety scores as compared to when there was no background music. The results also indicate that patients did not rate the services provided by either surgery or radiology clinics more favorably when Western classical music was playing then when there was no music in the background. On the contrary, the patients were least anxious, and rated the services provided by both clinics most favorably when there was no background music. Music is undoubtedly a multi-faceted concept and one possible explanation for the surprising pattern of results reported here could be that the selection of classical music used varied in dynamism, instrumental range, and harmonic progressions. A limited number of authors have argued that the more complex the musical stimuli, the more narrow the attentional focus (e.g., Hansen & Krygowski, 1994). Lo-fi music, by contrast, tends to have a repetitive motif with limited dynamic interest and range, possibly reducing the information processing load, and hence resulted in patients being less anxious than when western classical music was played. In fact, it is noticeable how previous research that used Western classical music (e.g., Labbé at al., 2007; Trappe, 2012) failed to specify the specific characteristics for the music used, and it is often unclear whether just a single piece of music was used. In this study, however, the rather broad range of Western classical music used may have influenced the degree of processing required. When considering the literature on the effects of classical music on people's mood and behaviour it is worth noting that the classical music genre comprises examples stretching all the way from calming (e.g., Sonata au Clair de Lune by Beethoven) through to anxiety-inducing – in the latter category consider only Igor Stravinsky's (1882–1971) 'The Rite of Spring', or 'Night on Bald Mountain' by Modest Mussorgsky (1839–1881). Hence, simply stating that classical music was played may not be sufficiently descriptive for the purposes of scientific understanding/replication.

Previously, Morrin and Chebat (2005) have reported that fast tempo background music (96bpm) in combination with an arousing citrus scent resulted in a positive indirect effect on the perception of service quality in a shopping mall. However there was no effect to perception of service quality when customers were played slow tempo music of 60bpm matched with the same citrus scent. In the present study, the time selected to conduct the experiment was the busiest period in both clinics. Hence it could be argued that the environment may simply not have matched the tempo of the Western classical music (60bpm) that was playing in the background. This, in turn, may have led to an incongruent setting, resulting in negative perceptions for both surgery and radiology clinics. On the contrary, the lo-fi music averaged 82bpm and may have been more congruent with the environment thus leading to a more positive evaluation as compared to the choice of Western classical music. In support for a congruent environment, a study by Mattilla and Wirtz (2001) revealed that fast tempo classical music in a gift shop, when matched with a 'high arousal' scent, led to consumers feeling more excited, pleased, and satisfied than when the 'low arousal' scent was matched with fast tempo classical music. In this study, however, since both pieces of music had differing tempos, it would be interesting for future studies to investigate if the exploitation of either one variable can affect anxiety and perception.

The findings reported here have important implications concerning the way in which music is used in hospital settings. **Since song selections may need to be matched to the differing pace of the day/session, achieving the 'right' musical tempo or a specially curated playlist could produce a more favorable outcome.** It has been reported that in certain commercial settings, faster tempo music is deliberately used to encourage a faster customer turnover, while slower tempo music is used at quieter times to encourage the customers to linger a little longer (Suddath, 2013). Future research may want to investigate on manipulating music tempo to achieve a more congruent setting. At the same time,

however, one important difference between the waiting room and retail scenarios concerns the fact that patients have little control over their situation (e.g., over the length of their wait).

Kaltcheva and Weitz (2006) reported that participants' motivation whether recreational (hedonic) or motivational (utilitarian) can have a positive or negative effect on pleasantness of commercial experiences. The authors found that when consumers had a recreational motivational orientation (for example shopping for jewelry), arousal had a positive effect on pleasantness. Conversely, when a consumer had a 'task motivational orientation (for example shopping for toiletries), arousal had a negative effect on pleasantness. A case in point is a study by Parlar et al., (2014) which used Turkish classical music on Turkish patients waiting at the emergency department. The authors reported that music had a positive effect in reducing the severity of pain and anxiety, but in spite of this, 21% of these patients were not pleased at all to hear music. Although the authors did not discuss in detail the findings here, it can be argued that patients at an emergency department would be in a 'task-oriented' mindset. In the present study, patients in both surgery and radiology clinics were presumably very much in a 'task-oriented' mindset, and the use of background music may have led to negative effects (see also Yeoh, 2010). It would be interesting to investigate if similar results would have been observed if background music was played in a more 'hedonic' environment. For example positive correlations to music might have been possible amongst patients waiting at a cosmetic plastic surgeon's office.

One such study was reported by Fenko and Loock (2014) who investigated the use of music and scent in a plastic surgeon's waiting room in Germany. They found that scent and music when used together did not significantly reduce anxiety, over the no sensory intervention baseline condition. In this case, the authors argued that the patients may have preferred medium levels of arousal (Berlyne, 1960), and the anxiety of waiting for their upcoming appointment with the surgeon was presumably a highly anxious event. Hence

combining two sensory modalities did not reduce patients' anxiety. However, that being said, it was not clear if the study had sufficient power to detect an effect had there been one. Although waiting time was not measured in the present study, the participants in both clinics rated their waiting times positively when no music was being played. Since the specific underlying reasons were not investigated, it may be helpful for future research to consider measuring waiting time and perception of time passing in more granular detail.

Finally, it is important to note how the significant effects of music on behaviour that may have been identified in one culture may not necessarily extend to another (Wang, 2016; Yeoh, 2010; Yeoh & North, 2013). Music, after all, is a cultural phenomenon and it is possible to imagine how music that may be considered 'relaxing' in one culture may not have the same connotations in another (Forde & Balkwill, 2010). The rationale for this study noted that research from the West could not be generalized to participants elsewhere, and a similar criticism could be made of the research reported here. **Music that primed certain beliefs among the West may not have similar effects among other groups of people as they may not derive the appropriate communicative intent from that music.** Future research could investigate if Malay classical music would be more fitting in this environment, since connotations of 'classical' music differs from one culture to another. In conclusion, Western classical music has the potential to influence perceptions, although the present research highlights possible limitations on the generality of this, and further research is undoubtedly necessary before practitioners can reliably use this in hospital settings.

## References

Baker, J., Grewal, D., & Parasuraman, A. (1994). The influence of store environment on quality inferences and store image. *Journal of the Academy of Marketing Science, 22*, 328-339. https://doi.org/10.1177/0092070394224002

Berlyne, D. E. (1960). *Conflict, arousal, and curiosity*. New York, NY: McGraw-Hill. https://doi.org/10.1037/11164-000

Brandt, J., Dileo, C., & Shim, M. (2013). Music interventions for preoperative anxiety. *Cochrane Data- base of Systematic Reviews, 6*(6), CD006908. https://doi.org/10.1002/14651858.cd006908.pub2

Chanda, M.L. & Levitin, D.J. (2013). The neurochemistry of music. *Trends in Cognitive Science, 17*(4), 179-193. https://doi.10.1016/j.tics.2013.02.007

Chen, L.C., Wang, T.F, Shih, Y.N., Wu, L.J. (2013). Fifteen-minute music intervention reduces pre-radiotherapy anxiety in oncology patients. *European Journal of Oncology Nursing, 17*(4), 436-441. https://doi.org/j.ejon.2012.11.002.

Chillhop Music (2019, December 28). *Chillhop Yearmix 2019 jazz beats & lofi hip hop* [Video]. YouTube. https://youtu.be/s49CT4DTAkw

Comeaux, T., & Steele-Moses, S., (2013). The effect of complementary music therapy on the patient's postoperative state anxiety, pain control, and environmental noise satisfaction. *Medsurg Nursing 22*(5), 313–318.

Court, H., Greenland, K., & Margrain, T. H. (2010). Measuring patient anxiety in primary care: Rasch analysis of the 6-item Spielberger State Anxiety Scale. *Value in Health Journal, 13*(6), 813-819.

Criscuolo, I. (2022, March 11). What is lo-fi music and why is it perfect for relaxing? *Domestika.* https://www.domestika.org/en/blog/10296-what-is-lo-fi-music-and-why-is-it-perfect-for-relaxing

Dailey, Y.M., Humphris, G.M., & Lennon, M.A. (2002). Reducing patients' state anxiety in general dental practice: a randomized controlled trial. *Journal of Dental Research, 81*(5), 319-322. https://doi.org/10.1177/154405910208100506

DeMarco, J., Alexander, J.L., Nehrenz, G., & Gallagher, L. (2012). The benefit of music for the reduction of stress and anxiety in patients undergoing elective cosmetic surgery. *Music and Medicine, 4*(1), 44-48. https://doi.org/10.1177/154405910208100506

Dijkstra, K. (2009). *Understanding healing environments: Effects of physical environmental stimuli on patients' health and well being*. [PhD Dissertation, University of Twente]. https://ris.utwente.nl/ws/portalfiles/portal/6084540/thesis_K_Dijkstra.pdf

Fenko, A., & Loock, C. (2014). The influence of ambient scent and music on patients ʾanxiety in a waiting room of a plastic surgeon. *Health Environments Research & Design Journal, 7*(3), 38-59. https://doi.org/10.1177/193758671400700304

Finn, S., & Fancourt, D. (2018). The biological impact of listening to music in clinical and nonclinical settings: A systematic review. *Progress in Brain Research, 237*, 173-200. https://doi.org/10.1016/bs.pbr.2018.03.007

Forde T.W., & Balkwill, L.L. (2010). Cross-cultural similarities and differences. In P.N. Juslin & J.A. Sloboda (Eds.), *Handbook of music and emotion: Theory, research, applications* (pp. 755-788). Oxford, UK: Oxford University Press.

Forsyth, A.J.M., & Cloonan, M. (2008). Alco-pop? The use of popular music in Glasgow pubs. *Popular Music & Society*, *31*(1), 57-78. https://org.doi/ 10.1080/03007760601061902

Grewal, D., Baker, J., Levy, M., & Voss, G. B. (2003). The effects of wait expectations and store atmosphere evaluations on patronage intentions in service-intensive retail stores. *Journal of Retailing, 79,* 259-68. https://doi.org/10.1016/J.JRETAI.2003.09.006

Halindonmusic (2020, December 28). 4 Hours Classical Music for Relaxation. [Video]. YouTube. https://youtu.be/OTmo3KIH31c

Hansen, C.H., Krygowski, W. (1994). Arousal-augmented priming effects: rock music videos and sex object schemas. Communication Research, 21(1), 24-47. https://doi.org/10.1177/009365094021001003

Henrich, J., Heine, S., & Norenzayan, A. (2010a). The weirdest people in the world? *Behavioral and Brain Sciences, 33*(2-3), 61-83. https://doi.org/10.1017/S0140525X0999152X

Henrich, J., Heine, S. J., & Norenzayan, A. (2010b). Most people are not weird. *Nature, 466,* 29. https://doi.org/10.1038/466029a

Höller, Y., Thomschewski, A., Schmid, E. V., Höller, P., Crone, J. S., & Trinka, E. (2012). Individual brain frequency responses to self selected music. *International Journal of Psychophysiology*, *86*(3), 206–213. https://doi.org/10.1016/j.ijpsycho.2012.09.005

Holm, L., & Fitzmaurice, L. (2008). Emergency department waiting room stress. Can music or aromatherapy improve anxiety scores? *Pediatric Emergency Care, 24*(12), 836-838. https://doi.org/10.1097/PEC.0b013e31818ea04c

Humphris, G.M., Clarke, H.M.M., & Freeman, R. (2006). Does completing a dental anxiety questionnaire increase anxiety? A randomised controlled trial with adults in general dental practice. *British Dental Journal, 201*(1), 33-35. https://doi.org/10.1038/sj.bdj.4813772

Hyde, R., Bryden, F., & Asbury, A.J. (1998). How would patients prefer to spend the waiting time before their operations? *Anaesthesia, 53*(2), 192-195. https://doi.org/10.1046/j.1365-2044.1998.00268.x

Iyendo, T.O. (2016). Exploring the effect of sound and music on health in hospital settings: A narrative review. *International Journal of Nursing Studies, 63,* 82-100. https://doi.org/10.1016/j.ijnurstu.2016.08.008

Jarred, J.D. (2003). *The effect of live music on anxiety levels of persons waiting in a surgical waiting room as measured by self-report.* [Master's dissertation, Florida State University] https://diginole.lib.fsu.edu/islandora/object/fsu:181834/datastream/PDF/view

Jones, M., & Brittain, D. (2009). Music in the waiting room. *The British Journal of General Practice, 59*(565), 613–614. https://doi.org/10.3399/ bjgp09x453864

Kaltcheva, V.D., & Weitz, B.A. (2006). When should a retailer create an exciting store environment? *Journal of Marketing, 70*(1), 107-118. https://doi.org/10.1509/jmkg.70.1.107.qxd

Kipnis, G., Tabak, N., & Koton, S. (2016). Background music playback in the preoperative setting: Does it reduce the level of preoperative anxiety among candidates for elective surgery? *Journal of PeriAnesthesia Nursing, 31*(3), 209-216. https://doi.org/10.1016/j.jopan.2014.05.015

Labbé, E., Schmidt, N., Babin, J., & Pharr, M. (2007). Coping with stress: the effectiveness of different types of music. *Applied Psychophysiology and Biofeedback 32*(3), 163–168. https://doi.org/10.1007/s10484-007-9043-9

Lai, J.C.Y., & Amaladoss, N. (2022). Music in waiting rooms: A literature review. *Health Environments Research & Design Journal, 15*(2), 347-454. https://doi.org/ 10.1177/19375867211067542

Liu, E.H.C., & Tan, S. (2000). Patients' perception of sound levels in the surgical suite. *Journal of Clinical Anesthesia, 12*(4), 298-302. https://doi.org/10.1016/s0952-8180(00)00155-0

Mackrill, J., Cain, R., Jennings, P., & England, M. (2013). Sound source information to improve cardiothoracic patients' comfort. *British Journal of Nursing, 22*(7), 387-393. https://doi.org/10.12968/bjon.2013.22.7.387

Marteau, T.M., & Bekker, H. (1992). The development of a six-item short-form of the state scale of the Spielberger State-Trait Anxiety Inventory (STAI). *British Journal of Clinical Psychology, 31*(3), 301-306. https://doi.org/10.1111/j.2044-8260.1992.tb00997.x

Mattila, A.S., & Wirtz, J. (2001). Congruency of scent and music as a driver of in-store evaluations and behavior. *Journal of Retailing, 77*(2), 273-289. https://doi.org/10.1016/S0022-4359(01)00042-2

Morrin, M., & Chebat, J.C. (2005). Person-place congruency: The interactive effects of shopper style and atmospherics on consumer expenditures. *Journal of Service Research, 8,* 181-191. https://doi.org/10.1177/1094670505279

North, A.C., Hargreaves, D.J., & McKendrick, J. (1999). The influence of in-store music on wine selections. *Journal of Applied Psychology, 84*(2), 271-276. https://doi.org/10.1037/0021-9010.84.2.271

Panda, A., Garg, I., & Shah, M. (2015). Children's preferences concerning ambiance of dental waiting rooms. *European Archives of Paediatric Dentistry, 16*(1), 27-33. https://doi.org/10.1007/s40368-014- 0142-z

Park, P., Simmons, R.K., Prevost, A.T., & Griffin, S.J. (2008). *Screening for type 2 diabetes is feasible, acceptable, but associated with increased short-term anxiety: A randomised controlled trial in British general practice. BMC Public Health, 8*(350). https://doi.org/10.1186/1471-2458-8-350

Parlar, K.S., Karadag, G., Oyucu, S., Kale, O., Zengin, S., Ozdemir, E., & Korhan, E.A. (2014). Effect of music on pain, anxiety, and patient satisfaction in patients who present to the emergency department in Turkey. *Japan Journal of Nursing Science, 12*(1), 44–53. https://doi.org/10.1111/jjns.12047

Ribeiro, M., Alcântara-Silva, T., Oliveira, J., Paula, T. C., Dutra, J., Pedrino, G. R., Simões, K., Sousa, R. B., & Rebelo, A. (2018). Music therapy intervention in cardiac autonomic modulation, anxiety, and depression in mothers of preterms: Randomized controlled trial. *BMC Psychology*, *6*(1), 57. https://doi.org/10.1186/s40359-018-0271-y

Rice, G., Ingram, J., & Mizan, J. (2008). Enhancing a primary care environment: a case study of effects on patients and staff in a single general practice. *British Journal of General Practice, 58*(552), 465-470. https://doi.org/10.3399/bjgp08X319422

Routhieaux, R., & Tansik, D.A. (1997). The benefits of music in hospital waiting rooms. *The Health Care Supervisor, 16*(2), 31-40.

Schäfer, T., Sedlmeier, P., Städtler, C., & Huron, D. (2013). The psychological functions of music listening. *Frontiers in Psychology*, *4*, 511. https://doi.org/10.3389/fpsyg.2013.00511

Silverman, M.J. (2015). Effects of live music in oncology waiting rooms: Two mixed methods pilot studies. *International Journal of Music and Performing Arts 3*(1), 1-15. http://dx.doi.org/10.15640/ijmpa.v3n1a1

Silverman, M.J., Christenson, G.A., Golden, D., & Chaput-McGovern, J. (2012). Effects of live music on satisfaction of students waiting for treatment in a university health clinic. *Music Therapy Perspectives, 30*(1), 43-48. https://doi.org/10.1093/mtp/30.1.43

Silverman, M.J., & Hallberg, J.S. (2015). Staff perceptions of live classical music in an urban medical clinic: A quantitative investigation. *Musicae Scientiae 19*(2), 135-146. https://doi.org/10.1177/1029864915583375

Spence, C. (2021). *Sensehacking: How to use the power of your senses for happier, heathier living*. London, UK: Viking Penguin.

Spence, C., & Keller, S. (2019). Medicine's melodies: On the costs & benefits of music, soundscapes, & noise in healthcare settings. *Music & Medicine, 11*(4), 211-225. https://doi.org/https://doi.org/10.47513/mmd.v11i4.699

Suddath, C. (2013, October 18). How Chipotle's DJ, Chris Golub, creates his playlists. *Businessweek.* https://www.bloomberg.com/news/articles/2013-10-17/chipotles-music-playlists-created-by-chris-golub-of-studio-orca?leadSource=uverify%20wall

Tansik, D. A., & Routhieaux, R. (1999). Customer stress-relaxation: The impact of music in a hospital waiting room. *International Journal of Service Industry Management, 10,* 68-81.

Taylor-Piliae, R.E., & Chair, S.Y. (2002). The effect of nursing interventions utilizing music therapy or sensory information on Chinese patients' anxiety prior to cardiac catheterization: A pilot study. *European Journal of Cardiovascular Nursing, 3,* 203-211. https://doi.org/10.1108/09564239910255389

Thaut, M.H., & Wheeler, B.L. (2010). Music therapy. In P.N. Juslin & J.A. Sloboda, (Eds.), *Handbook of music and emotion: Theory, research, applications* (pp. 791-817). Oxford, UK: Oxford University Press.

Trappe, H.J. (2012). Role of music in intensive care medicine. *International Journal of Critical Illness & Injury Science, 2*(1), 27-31. https://doi.org/10.4103/2229-5151.94893

Vaughn, F., Wichowski, H., & Bosworth, G. (2007). Dose preoperative anxiety level predict postoperative pain? *AORN Journal 85*(3), 589-604.

Ventura, T., Gomes, M.C., & Carreira, T. (2012). Cortisol and anxiety response to a relaxing intervention on pregnant women awaiting amnio centesis. *Psychoneuroendocrinology, 37*(1), 148-156. https://doi.org/10.1016/j.psyneuen.2011. 05.016

Waldon, E.G., & Thom, J.C. (2015). Recorded music in the mental health waiting room: A music medicine investigation. *The Arts in Psychotherapy, 46,* 17-23. https://doi.org/10.1016/j.aip.2015.07.006

Wang, J. (2016). Classical Music: a norm of "common" culture embedded in cultural consumption and cultural diversity. International Review of the Aesthetics and Sociology of Music, *47*(2), 195-205. https://doi.org/10.1177/0038038518772737

Yeoh, J.P.S. (2010). Musical fit and willingness to pay for utilitarian products among university students. *Pertanika Journal of Social Sciences and Humanities, 18*(1), 1-10.

Yeoh, J.P.S., & North, A.C. (2009). The effects of musical fit on choice between competing pairs of cultural products. *Empirical Musicology Review, 4*(4), 130-133. https://doi.org/10.18061/1811/44658

Yeoh, J.P.S., and North, A.C. (2012). The effect of musical fit on consumers' preferences between competing alternate petrols. *Psychology of Music, 40*(6), 709-719. https://doi.org/10.1177/0305735611408994

Yeoh, J.P.S., & North, A.C. (2010). The effects of musical fit on choice between two competing foods. *Musicae Scientiae*, *14*(1), 165-180. https://doi.org/10.1177/102986491001400107

Yeoh, J.P.S., & North, A.C. (2013). The effects of musical fit on consumers' choice when opportunity and ability is limited. *Pertanika Journal of Social Sciences and Humanities*, *21*(1), 105-118.

Zellner, D., Geller, T., Lyons, S., Pyper, A., & Riaz, K. (2017). Ethnic congruence of music and food affects food selection but not liking. *Food Quality & Preference*, *56*, Part A, 126-129. https://doi.org/10.1016/j.foodqual.2016.10.004