
# The effect of relaxing music on self-reported anxiety and stress.

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**Abstract**

**Aims**: The present study sought to provide a better understanding of the impact of relaxing music on both stress and anxiety. This study examined the effect of relaxing music on self-reported stress and anxiety. This study explored the impact of gender on perceived stress levels. This study also investigated if relaxing music would impact one gender's stress levels more than the other. **Method:** An online experiment was conducted, where participants (N=25) were divided into two groups (relaxing music and no-music control) and asked to complete a baseline questionnaire, measuring subjective stress and anxiety. They were then exposed to a stressor (mental arithmetic task). Those in the music group listened to 'Miserere' by Allegri and those in the control group spent 5 minutes in silence, before filling out their final set of scales. **Results:** Findings revealed that relaxing music had a significant effect on anxiety levels. However, there was no significant effect for music on stress scores. Follow up t-tests discovered no significant difference in subjective stress levels between males and females. There was also no significant difference regarding the impact of relaxing music on subjective stress levels between males and females. **Conclusion:** Implications for this study and advice for future research are discussed.

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# Literature review

## Introduction to Stress and Anxiety

Stress occurs when there is an imbalance between the demands of an individual's surroundings and the individual's appraisal of their resources, as insufficient to successfully deal with these demands (Monroe, 2008). Acute stress responses usually impose no real health burdens on young and healthy individuals (Schneiderman et al., 2005). Chronic stress or prolonged stress, however, can lead to detrimental effects on an individual's health (McEwen, 1998; Chida & Steptoe, 2010). Stress also comes with the negative emotions of tension, fear, and particularly anxiety (Pelletier, 2004). Anxiety is typically viewed as a negative emotional response to environments or situations deemed threatening (Spielberger, 1989). Anxiety routinely produces subjective feelings of tension, uneasiness, apprehension, and worry (Bourne, 2000; Lazrus, 1966). Anxiety is a very common reaction to stress and therefore both stress and anxiety are interlinked. To limit this feeling of anxiety, it is important to understand factors that make one more susceptible to stress and to explore coping methods for this stress to limit anxiety.

## Factor impacting stress- Gender

Gender is said to play a role in levels of stress and a high volume of research conveys that women experience more stressful circumstances than men (McDonough & Walters, 2001). Studies typically highlight women as more prone to experiencing high, chronic stress than men (APA, 2017; Matud, 2004). This increase in chronic stress can heighten the risk of

them developing and dying from life-threatening conditions such as cardiovascular disease, organ failure, and cancer (Cohen et al., 2015; Reiche et al., 2004). Many researchers believe that this finding is perhaps due to women viewing stressors as more threatening than males and subsequently results in them reporting worrying events as more stressful than men (Ptacek et al., 1992). Gilmore et al., (2019) supports this idea in their study when female participants reported greater subjective stress levels than their male counterparts after exposure to the Trier Social Stress Test (Kirschbaum et al., 1993). Coinciding with these results, female college students also tend to report higher levels of stress than male students (Eagan et al., 2016). Overall, this result is emphasized in the vast majority of the literature (Kelly et al., 2008; Kudielka et al., 1998; Santl et al., 2019). However, this could perhaps be due to the fact women and men have different sources of stress (APA, 2012), and the stress induced by these experimental tasks is just perceived to be more stressful to females (Barnett, 1987). Therefore, more studies must explore both males and females stress levels in a variety of settings, to ensure the existing literatures findings are not too premature. Ultimately regardless of these apparent gender differences, it is clear stress is a universal experience, and its effects can be detrimental for all (McEwen, 2008). Therefore, coping methods for stress could be useful for all.

**Coping methods for Stress and anxiety**

Stress has become a widespread subject of study due to the knowledge that stress is a causal factor in both psychological and physical illness (Pervin & John, 1997). Stress is simply an unavoidable by-product of living as it is a part of everyone's everyday life. Effectively coping with stress is ultimately determined by the individual's cognitive appraisal of the worrying situation. If the person deems their resources as sufficient to deal with the

stressor, they will cope more positively (Lazrus & Folkman, 1987). The literature expands on this knowledge by outlining the two key coping processes (Compas, 1987). Problem-focused coping aims to act on the stressor, and emotion-focused coping intends to regulate the intense emotions that surface in response to the stressor. These processes are also known as active and passive coping styles (Jex et al., 2001). As well as these healthy coping strategies, avoidance-style measures of coping can occur when one views their resources as insufficient to deal with their demands. This involves distancing, withdrawal, and assertiveness (Anshel & Weinberg, 1999). This process is consistently highlighted in past literature. Shahmohammadi (2011) found in his research that adolescents usually withdraw from their stressor instead of facing it, demonstrating that they are not properly coping. Holahan et al., (2005) found similar results amongst adult participants. This stress avoidance could be a direct result of individuals not understanding how to manage their stress. This can ultimately lead to many desperate individuals turning to tranquilizing medication to manage their stressors. This medication is linked with various contraindications and negative side effects (Olfson et al., 2015). As a result, the need for non-pharmacological and cost-effective stress interventions are high (Casey, 2017). A large amount of effort is made by the current research for this vital endeavour (Holahan et al., 2005; McEwen & Gianaros, 2010). Methods that have successfully been shown to help individuals manage stress include Mindfulness-based stress reduction (Bergen-Cico et al., 2013) and Cognitive Behavioural Therapy (Bhui et al., 2012). Although these coping techniques do decrease stress and anxiety, it is vital to determine other potential coping strategies that are more universally available and yet equally effective in reducing stress and anxiety. The effect of relaxing music on stress has become a widely regarded intervention tool for stress management, as it is highly accessible, inexpensive, and non-invasive (de Witte et al., 2020).

**The effect of relaxing music on stress and anxiety**

Music can help stress-related emotional states, like anxiety and subjective worry (Akin & Iskender, 2011; Pritchard, 2009). This is due to its capability of modulating activity in the brain that plays a role in emotional processing. Music influences the amygdala, which leads to an increase in endorphins, heightening one's overall health and sense of well-being (Koelsch, 2015; Zatorre, 2015). The beneficial effect of music is strongly mediated by its impact on one's stress response (Thoma et al., 2011). Many studies have shown the effectiveness of relaxing music on stress and anxiety, in a wide range of settings (Bradt & Teague, 2018; Voss et al., 2004).

Early past research hugely focuses on the anxiety-reducing effect of relaxing music on patients undergoing various medical procedures. They investigated this impact by utilizing scales like the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983). Relaxing music that consists of a slow tempo, strings, and repetitive rhythm is widely used in past research (Knight & Richard, 2001). This relaxing music has been highlighted to reduce patients' physiological stress reactivity (Nyklicek et al., 1997) and subjective anxiety levels (Wang et al., 2002). This decrease was witnessed in a scope of clinical settings including surgical settings, critical care environments, dental surgery applications, and mental healthcare (Biley, 2000; Standley,1992). For example, a study conducted by Winter et al., (1994) showed that when patients who were waiting for their surgery to commence, listened to preferred relaxing music, they reported lower levels of anxiety, than the patients who waited in silence. Updike, (1990) also found that when myocardial infarction patients listened to unwinding classical music, their subjective anxiety levels were significantly lower than their levels were before exposure to the music. Overall, early research in this area indicates that listening to music can decrease psychological stress (Allen et al., 2001) and subjective anxiety (Knight & Richard 2001; Labbé et al., 2007; Wang et al. 2002). However, this finding was not always the case.

Barnason et al., (1995) found no effect of relaxing music on self-reported anxiety levels in coronary care patients. Zimmerman et al., (1988) reported similar findings. These conflicting findings could be a result of the heterogeneity introduced by conducting the studies in very diverse medical settings and the strong focus on patient samples.

More recent studies also show the strong effect of relaxing music on both stress and anxiety in a wider variety of settings including both patients and university students (Chanda & Levitin, 2013; Gillen et al., 2008). For example, a study conducted by Smith & Melissa (2008) highlighted a decrease in subjective anxiety levels, after exposure to relaxing music in an occupational setting. Coinciding with these results, studies also show that listening to relaxing music can decrease physiological indices of stress including heart rates, respiration rates, and blood pressure (Pittman & Kridli, 2011; Wu et al., 2017). A meta-analysis including both university and occupational settings conveyed an overall decrease in stress arousal when participants were exposed to relaxing music (Pelletier, 2004). Thoma et al., (2013) also found that students who were exposed to relaxing music before a standardized stressor had a faster recovery (in terms of the autonomic nervous system) than those patients who were not exposed to music. Overall, these results concur with most studies that find a significant decrease in stress-related responses, including a significant decrease in levels of self-reported anxiety (Lai & Li, 2011). However, although a vast number of studies conclude that relaxing music can reduce perceived levels of stress and anxiety (De la Torre-Luque et al., 2017), this is not always the case. Several studies emphasize music as ineffective in reducing self-reported anxiety and perceived stress (Evans, 2002; Nilsson, 2008; Richards et al., 2007; Teckenberg-Jansson et al., 2019). Methodological issues such as poor statistical techniques, lack of adequate baselines, and small sample sizes could be accountable for the inconsistency across the more recent study's findings.

A key issue when exploring the anxiolytic effect of relaxing music involves the selection of appropriate stimuli. Past research in this area typically adopts one of two approaches. The first approach is a participant-centred approach where the participant chooses the relaxing music. The second approach being the experimenter-centred approach where the music piece is chosen by the experimenter. The first approach has an inherent bias as the participant may inadvertently over evaluate the effect of the music (Karageorhis et al., 1999). The second approach, however, nullifies this expected response bias. Nevertheless, the participant-centred approach is highly utilized by past research (Burns et al., 1999; Helsing et al., 2016; Labbé et al., 2007). Therefore, more studies should be conducted adopting the later approach to control for this bias and investigate the true effect of relaxing music.

In addition to this, when examining past literature's findings on the impact of relaxing music, they tend to use the terms state-anxiety and stress interchangeably. Many of the studies within this area believe state anxiety to be a stress-related emotional state (Hook et al., 2008; Zhang et al., 2014). Consequently, they utilize a wide selection of self-reporting measures for the one term. Therefore, it is vital to assess whether music has the same impact on state anxiety and stress.

**The current study**

Overall, a large selection of research has been conducted on the effect of relaxing music on self-reported stress and anxiety. The existing literature shows that music has a strong effect on subjective stress and anxiety, however, there have been inconsistencies shown. For example, in a review of 42 studies, only 50% of the cases found that music had the wanted psychological effect on anxiety (Watanabe, 2001). This could be perhaps due to the varying approach methods across studies (Participant vs experiment selected- music) and

using potentially different terms interchangeably (stress and state anxiety). In addition to this, several studies highlight methodological issues like poor statistical techniques, small sample sizes, and failure to apply adequate baselines as the reasons behind the inconsistency in study results (Biley, 2000). These inconsistencies preclude researchers from making any firm conclusions about the benefit of using relaxing music to effectively cope with stress and anxiety. Also, although past research does include the student population, there is a strong emphasis on patients, rather than the general population. A varied sample is needed as stress and anxiety can be experienced by any individual regardless of age, gender, or background (Liddon et al., 2018). Finally, although past research has examined the impact of gender on stress levels. To the greatest extent of our knowledge, no study has investigated if relaxing music impact's one gender's stress levels more than the other. This is vital to determine effective stress coping strategies for each gender.

The current study will consider these downfalls and aims to improve on past studies mistakes. It will accomplish this by utilizing an adequate sample size, that is varied and generalizable to the general population. It will also use the experimenter-selected approach; meaning a standardized calming music stimulus will be adopted for all participants. This will control for the potential influences of memory or subjective associations that goes along with the participant-centred approach. Unlike past research, it will view stress and state anxiety as distinct terms and investigate if music has the same effect on both. Additionally, the current study also seeks to investigate if women report higher stress levels than men. While past research does strongly emphasize this point (Pryor et al., 2010). It will be interesting to examine whether this is the case for this study as it is taking place virtually. Therefore, the stress that may perhaps be caused by technology or the stress that goes along with Covid-19, could create extraneous variables, and alter the source of stress. Hence, this could influence

stress perception. Finally, unlike past research, it will examine if relaxing music impact's one gender's stress levels more than the other.

Consequently, the current study aims to provide a greater understanding of the effect of relaxing music on the general population, through exploratory analysis. This study aims to investigate the effect of relaxing music on levels of perceived stress and anxiety, after exposure to an acute stressor. This study also aims to explore if gender influences perceived stress levels and if relaxing music impacts one gender's stress levels more than the other. These aims produce the following research questions and hypothesis:

Research question 1: Does relaxing music have an effect on self-reported anxiety levels? Hypothesis for research question 1: Relaxing music will cause a reduction in self-reported anxiety levels, after stressor, compared to the no-music control.

Research question 2: Does relaxing music have an effect on perceived stress levels? Hypothesis for research question 2: Relaxing music will cause a reduction in subjective stress levels, after stressor, compared to the no-music control.

Research question 3: Does gender impact subjective stress levels? Hypothesis for research question 3: Gender will impact levels of perceived stress at baseline.

Research question 4: Does relaxing music impact one gender's stress levels more than the other? Hypothesis for research question 4: Relaxing music will impact one gender's stress levels more than the other.

# Methods

## Participants

Convenience sampling was used to recruit participants. A brief introduction to the study and the link to the study's information sheet was distributed through various social media platforms- including, Facebook, Instagram and Tik Tok. In line with ethical considerations, only participants over the age of 18 were eligible for participation. The initial sample consisted of 30 participants. However, 5 individuals did not fully complete the experiments scales and requirements due to technical issues and were therefore excluded in the data analysis. The final sample for the current study consisted of 25 participants (Males: *n*= 8; Females: *n* = 17). Participants were separated into two different groups, the relaxing music group which consisted of 12 participants and the control group which had 13 participants. Participants resided in counties in Ireland (Dublin and Meath). Of the participants recruited 11 (44%) were employed, 5 (20%) were unemployed and 9 (36%) were students. Participants age ranged from 19 to 61, with a mean age of 31.80 (SD= 13.55).

## Measures

**Demographics.** A demographic Questionnaire was administered to acquire a general profile of those participating. Participants were asked to indicate their age, gender, residing county and occupation (Employed, unemployed, student).

**State-Trait Anxiety Invetory.** The State-Trait Anxiety Invetory (STAI; Spielberger et al., 1983) (see Appendix D) was used in the current study to measure anxiety. The STAI is a 20 item Likert scale with items measured on a four-point scale ranging from 1 "not at all" to 5 "very much so". An example of an item within this scale is as follows: *I feel calm.* The ten positively stated items (items 1, 2, 5, 8, 10, 11, 15, 16, 19 and 20) were reversed scored. The anxiety score can range from 20 to 80, with higher scores representing higher levels of

anxiety. The STAI is one of the most widely used measures of general anxiety and is highly reliable (Spielberger, 2010). Internal consistency for the STAI is high and estimates range from 0.90 to 0.94. The Cronbach's Alpha for the current study was ($\alpha = .89$), this indicates a high level of internal consistency for this scale.

**Perceived Stress Scale.** The Perceived Stress Scale (PSS: Cohen et al., 1983) (see Appendix E) was used to measure subjective stress. The PSS is the most common psychological indicator of stress perception. The PSS is a 10 item Likert scale, with items measured on a five-point scale ranging from 0 "never" to 4 "often". An example of an item is as follows: *In the last month, how often have you felt that you were unable to control the important things in your life?* The four positively stated items (items 4, 5, 7 and 8) were reversed scored. Participants scores on the PSS can range from 0 to 40 with higher scores representing higher perceived stress. This measure has good internal consistency reliability (Cronbach's alpha $\geq 0.70$). (Lee, 2012). In the current study, the Cronbach alpha coefficient for the PSS was .88. This suggests a high level of internal consistency, with the current sample.

**Design and analyses**

The current study used a Quantitative approach with an experimental design. A $2 \times 2$ mixed repeated measures ANOVA was conducted to investigate the first and second hypothesis. Here, the within- subject IV was time and the between-subject IV was music. The dependent variable was anxiety/stress. To investigate the third hypothesis, an independent samples t-test was conducted. Gender was the dependent variable and stress score was the independent variable. To investigate the fourth hypothesis, a mixed ANOVA was conducted. The within- subject IV here was time and the between-subject IV was gender. The dependent variable was stress.

**Procedure**

Due to the unprecedented circumstances, regarding the Coronavirus. A pilot study was firstly conducted to ensure the experiment runs smoothly online, via Microsoft Teams. Convenience sampling was used to recruit participants. The pilot sample consisted of 8 participants (4 per group). The pilot study largely followed the same procedure as the main experiment. However, here the relaxing music was played for all participants by the researcher, through Microsoft Teams "share audio" function. This was changed in the main experiment as there was issues with audio quality and frequent freezing.

For the main experiment, the participants were recruited through social media platforms. The post contained all the necessary information about the study, including where it would take place (virtually via Microsoft teams), its date and some of the benefits for participation (see Appendix B). Participants who were willing to take part were randomly assigned to one of two groups- the relaxing music group or the no music control. They were given further details regarding the study via email, including the set date, time (depending on their group) and how long the study was expected to take (40-50 minutes). Participants were not aware of the study's actual objectives, to ensure their blinding. However, once the study was completed participants potentially learned the benefits of applying relaxing music towards some of the stressful situations they experience in their everyday life.

On the day of the study, participants were welcomed and given instructions regarding the experiment. All participants were told of their ethical rights and informed consent was acquired, via Google Forms (see Appendix A). Participants were asked to sit in an upright, comfortable position in their chair throughout the entire experiment. They were then instructed to fill out the demographic questionnaire and baseline scales. These scales consisted of the State-Trait Anxiety Invetory (see Appendix D) and Perceived Stress Scale

(see Appendix E). Once they were completed participants were asked to engage in a mental arithmetic task (stressor). Participants individually turned on their mic and camera and counted down in steps of 14, starting at 200. Once each participant completed the task, they either listened to the relaxing music, 'Miserere' by Allegri (Tenebrae Choir, 2018) (see Appendix F) or spent 5 minutes in silence (depending on assigned group). The relaxing music was played on the individuals own device through their headphones, via YouTube, while the meeting was muted. They were asked to fill out their second set of scales, directly after listening to the music and hit send. Once everyone pressed the "raise hand" button, the researcher knew everyone had completed the task. Participants were fully debriefed and told the true experimental purposes (see Appendix C). The researcher thanked the participants for their time and invited them to email if they have any further questions or queries regarding the finished experiment.

# Results

## Descriptive Statistics

Descriptive statistics were performed for all categorical variables including gender, county of residence, occupation, and music. The results for all four categorical variables are presented below in table 1.

Table 1

*Descriptive statistics for all categorical variables, N=25*

| Variable | Frequency | Valid % |
|---|---|---|
| **Gender** | | |
| Female | 17 | 68 |
| Male | 8 | 32 |
| **County** | | |
| Dublin | 23 | 92 |
| Meath | 2 | 8 |
| **Occupation** | | |
| Student | 9 | 36 |
| Employed | 11 | 44 |
| Unemployed | 5 | 20 |
| **Music** | | |
| Yes | 12 | 48 |
| No | 13 | 52 |

Descriptive statistics were also completed for all continuous variables including age, STAI pre, STAI post, PSS pre and PSS post. Means (M), Standard Deviations (SD), and Range were all obtained. The results for all continuous variables are presented below in table 2.

Table 2

*Descriptive statistics for all continuous variables, N=25*

| Variable | *M* [95% CI] | *SD* | Range |
|---|---|---|---|
| Age | 31.80 (26.21-37.39) | 13.55 | 42 |
| STAI PRE | 42.48 (38.47-46.49) | 9.73 | 43 |
| STAI POST | 45.76 (40.32-51.20) | 13.18 | 46 |
| PSS PRE | 21.44 (18.59-24.29) | 6.91 | 27 |
| PSS POST | 22.96 (20.46-25.46) | 6.07 | 24 |

**Inferential Statistics**

A 2 × 2 mixed repeated measures ANOVA was conducted to examine the effect of time (pre and post) and music (yes and no) on anxiety. The within-participant IV was time and was measured on two levels (pre vs post), the between-participant IV was music and was measured on two levels (yes vs no), and DV was anxiety scores. The analysis revealed no significant main effect for time ($p$ =. 21). However, there was a significant main effect for music; $F$ (1, 23) = 6.28, $p$ = .02, partial Eta squared = .22. There was also a significant interaction effect; $F$ (1, 23) = 19.78, $p$ >.01, partial Eta squared = .46. This suggests that there was no difference

between pre- and post-scores on the outcome of anxiety. However, listening to music (or not) did have an effect on anxiety scores.

A 2 × 2 mixed repeated measures ANOVA was conducted to examine the effect of time (pre and post) and music (yes and no) on stress. The within-participant IV was time and was measured on two levels (pre vs post), the between-participant IV was music and was measured on two levels (yes vs no), and DV was stress scores. The analysis revealed no significant main effect for time ($p$ =. 42). There was also no significant main effect for music (p=.91) and no significant interaction effect ($p$= .24). Results indicate that there was no difference between pre- and post-scores on the outcome of stress and that listening to music (or not) did not have an effect on stress scores.

An independent samples t-test was conducted to compare levels of stress (DV) between males and females (IV). There were no significant differences between males and females (p=.15).

A Mixed ANOVA was conducted to examine the effect of time (pre and post) and gender (yes and no) on stress levels within the relaxing music group. The within-participant IV was time and was measured on two levels (pre vs post), the between-participant IV was gender and was measured on two levels (male and female), and DV was stress scores. The analysis revealed no significant main effect for time ($p$ =. 80). There was also no significant main effect for gender (p=.57) and no significant interaction effect ($p$= .90). Results indicate that there was no difference between pre- and post-scores on the outcome of stress and that gender did not have an effect on stress scores in the relaxing music group**.** This ultimately highlights that gender does not affect the impact of relaxing music on subjective stress levels.

To summarize, there was a significant main effect for music on anxiety levels. There was also a significant interaction effect between time (pre and post) and music on anxiety

levels. This indicates that listening to music (or not) did significantly affect anxiety scores. However, there was no significant main effect for music on stress scores and no significant interaction effect between time and music on stress levels. This suggests that listening to relaxing music (or not) did not have an effect on subjective stress scores. Also, there was no significant difference in perceived stress levels between males and females. Finally, there was no significant difference regarding the impact of relaxing music on subjective stress levels between males and females.

## Discussion

The present study sought out to explore the effect of relaxing music on self-reported anxiety and stress. This study also aimed to examine the impact of gender on subjective stress levels. Lastly, this study aimed to investigate if relaxing music would impact one gender's stress levels more than the other. Previous research has highlighted a strong impact of relaxing music on self-reported stress and anxiety (Gillen et al., 2008; Lai & Li, 2011). Prior findings have also emphasized gender as a significant factor influencing stress, with females reporting significantly higher stress levels than males (Gilmore et al., 2019; Santl et al., 2019). With regards to the impact of the relaxing music on males and females stress levels, very little rigorous research has been conducted. To the greatest extent of our knowledge no study has scientifically evaluated if the impact of relaxing music differs between males and females. Through this research, four hypotheses were formed to address the aims of this study.

Based on past literature it was hypothesized that (H1) relaxing music would cause a reduction in self-reported anxiety levels, after stressor, compared to the no-music control. This was investigated using a 2 × 2 mixed repeated measures ANOVA. From this it was found that relaxing music caused a significant decrease in anxiety levels. This finding is consistent with many studies that emphasize relaxing music as significantly reducing self-reported anxiety levels (Chanda & Levitin, 2013; Smith & Melissa 2008).

For H2, another 2 × 2 mixed repeated measures ANOVA was conducted to examine if relaxing music would decrease subjective stress levels. Results showed that relaxing music did not significantly reduce participants subjective stress levels. This contradicts prior literature that highlights relaxing music as effectively decreasing perceived stress levels (De la Torre-Luque, 2017; Juslin & Västfjäll, 2008; Koelsch, 2015). This is perhaps contradictory

due to past methodological differences, like the various scales applied and prior literature using the terms state-anxiety and stress interchangeably. Therefore, it is possible that the relaxing music can provide a distraction for stress-increasing thoughts and feelings, such as anxiety (Bernatzky et al., 2011), but does not have any effect on the individual's appraisal of their more long-term stressors.

For H3, an independent samples t-test was performed to compare subjective stress levels between males and females. The analysis revealed a non-significant effect, meaning there was no difference in males and females perceived stress levels. This hugely conflicts with past research that emphasizes females as reporting higher stress levels than males (Eagan et al., 2016; Kelly et al., 2008; Santl et al., 2019). This could be possibly due to the current study's somewhat small and unequal sample size, which may decrease the generalizability of the findings.

Lastly, H4 states that relaxing music would impact one gender's stress levels more than the other. This was explored using a mixed ANOVA. This revealed no difference in the impact of relaxing music between both genders. This hypothesis was novel, and no research has yet fully examined gender differences in the impact of relaxing music. However, the result is somewhat surprising due to the fact women and men have different sources of stress (APA, 2012) and therefore may potentially need different coping methods. Therefore, relaxing music may not necessarily be a useful stress management technique for all. The lack of rigorous research and vitality of exploring efficient coping methods, warrants this to be further explored on a greater level. Based on all the above findings, hypothesis 1 can be accepted and hypothesis 2, 3, 4 can be rejected.

Our findings contribute to the growing literature examining the impact of relaxing music on self-reported anxiety and stress. Unsurprisingly, our findings emphasize a

significant effect of relaxing music on self-reported anxiety. Therefore, results are consistent with past literature showing reductions in state anxiety in hospital settings (Nilsson, 2008; Smolen, Topp, & Singer, 2002) and university settings (Labbe´ et al., 2007). The key contribution of this study lies in its sample; meaning the use of a varied population ensures results are generalizable to the wider population. This was necessary to confirm that relaxing music was valuable outside of past study's limited settings. Thus, based on the current study's findings, we can now promote relaxing music as an anxiolytic and universal treatment for various individuals.

Interestingly, as our study revealed no significant effect of relaxing music on subjective stress, challenging the existing literature (Chanda & Levitin, 2013; Pelletier, 2004). Findings further past research by revealing relaxing music as potentially having a different impact on state anxiety and subjective stress. Results highlight the possibility that the stressor is not as effective in an online context. This could be perhaps due to some participants not engaging in the cognitive task correctly and potentially utilizing a calculator. Although this was controlled for as much as possible by asking participants to turn their cameras on, this possibility cannot be completely ruled out. Although the stressor did impact individual's anxiety levels, it was perhaps not strong enough to impact the participant's overall stress appraisal in an online context.

Also, our study revealed no difference in stress levels between males and females. This conflicts with past literatures findings emphasizing female's stress levels as significantly higher than male's (Eagan et al., 2016). Perhaps the online experiment and the use of technology created an extraneous variable altering the source and outcome of stress, unlike past research conducted in an in-person experimental setting. Therefore, our study contributes to past research by heightening the need for more studies to investigate stress levels in

numerous different settings. This is vital to ensure we are not undervaluing male's experience of stress and ultimately limiting the negative and universal consequences of stress for all.

**Implications**

Findings obtained in the present study have valuable theoretical and practical implications. This study joins the growing literature accumulating emphasizing relaxing music as effective in reducing stress related outcomes like anxiety. However, more research is required to investigate the individual differences regarding this impact. For example, some studies with distressed or vulnerable highlight that relaxing music does not impact anxiety levels for all (Baker et al., 2008; McFerran et al., 2015). Therefore, the extent of this impact needs to be further explored.

As this study does not support the hypothesis that relaxing music effects stress perception. The key practical implication of this study is that relaxing music should be considered as a non-pharmacological, accessible, inexpensive method for dealing with feelings of anxiety. From a societal point of view the current study calls for the health system to recognize relaxing music as an efficient way of coping with anxiety. This could be as simple as offering relaxing music before or during a medical procedure to calm patients' feelings of anxiety or utilizing it for individual's dealing with the negative effects of anxiety regularly could prove beneficial. The mental health system and the minister of health (Simon Harris TD) should take methods of reducing anxiety seriously, particularly due to the close link of anxiety with depression, substance abuse and suicidal thoughts (Dobson, 1985; Gum et al., 2009). Therefore, a policy outlining relaxing music as an effective way of dealing with anxiety could prove hugely valuable. Not only would this benefit the public, but it would also

be beneficial to the government. Targeting anxiety could additionally decrease its negative outcomes (depression, suicide, etc). This may result in excess funding for other areas.

**Limitations and future research**

The present study has several limitations that should be considered when interpreting our findings and planning future research. Firstly, this study utilized a self-report scale to measure subjective stress. The Perceived Stress Scale although is widely used and has good reliability, only contains 10 items. These 10 items consider stress on a more long-term basis. Thus, the scale perhaps was not detailed or sensitive enough to capture the participant's momentary stress. However, despite this, the current study does recognize stress and state-anxiety as individual terms. Unlike past research that utilizes both terms interchangeably (Zhang et al., 2014). As a result, this allowed us to investigate the individual effects of relaxing music on stress and state-anxiety separately. Future studies should also consider stress and state-anxiety as distinct terms to further explore the perhaps varying effects, but should utilize a more suitable and in-depth scale, to explore subjective stress.

Secondly, due to the experiment being conducted online and the prevalence of online audio issues when sharing sound. The participants had to listen to the relaxing music individually on their devices. The lack of experimenter control of this variable leads one to question if everyone did listen to the music and if this impacted findings. However, the current study did make it very easy for all participants to access the link to the relaxing music and gave exact instructions to participants before listening to the music. For example, participants were all advised to listen to the music with headphones at a loud but comfortable volume for them and asked to sit in an upright comfortable position in a chair. This helped control for the individual and postural differences on stress/anxiety levels. Nevertheless,

future studies conducting a similar experiment online and wishing to share audio should consider using a different app with a better "audio share" function. This will ensure that everyone's experience whilst listening to the music is as close to being identical as possible.

Finally, due to the drop-out rate of 5 participants, the sample size was slightly less than optimal. This ultimately decreases the generalizability of the findings. In addition to this, the sample was unequal, regarding gender. There were particularly more female participants, than males (Males: $n$= 8; Females: $n$ = 17). As previous research has highlighted that females typically score higher in perceived stress levels than males, perhaps having a more balanced sample would have yielded different findings and perhaps supported this idea. However, the current study does utilize a varied sample that consists of individuals across a wide range of age groups and occupations. Unlike past research that primarily focuses on patients and students, this diverse sample adds to past literature investigating the impact of relaxing music and furthers the generalizability of the findings.

Regardless of the limitations identified, this study does have a key strength in its novelty. Not only does it adopt an online approach to experimentation. It investigates a novel hypothesis that is widely unknown, by examining if relaxing music differs in its impact on both genders stress levels. This is vital in order to explore if relaxing music is perhaps a more effective coping method of stress for one gender more than the other. Through understanding these potential differences, we can promote the most superlative ways of targeting the detrimental effects of stress and anxiety. Future studies should further this approach by exploring the individual differences (gender, age, past experiences) in the outcome of relaxing music on stress and anxiety on a much greater scale.

## Conclusion

Overall, this study joins the growing literature investigating the impact of relaxing music on stress and anxiety. The current study contributes to previous literature by examining relaxing music's effect on state-anxiety and stress separately, rather than interchangeably. The present study provides high-level evidence that relaxing music can be effective in reducing levels of anxiety. However, our study directly contradicts past findings by highlighting relaxing music as ineffective in reducing perceived stress levels. Considering gender's impact on subjective stress levels, the current study is inconsistent with past studies emphasizing women as reporting higher stress than males. However, it is important to note that the somewhat small sample size could have impacted this finding. The present study also adds to past research by being one of the first to examine if relaxing music impacts one gender's stress levels more than the other. Findings revealed no difference in the impact of relaxing music between both genders. Generally, results highlight the importance of utilizing relaxing music when experiencing feelings of anxiety. This non-pharmacological and low-cost method can potentially limit anxiety, and consequently, restrict other negative outcomes like depression and substance abuse. Finally, although the current study takes a vital step for generalizability by utilizing an extremely varied sample. Further research is still required to explore the individual differences in relaxing music's outcome on stress and anxiety. This is vital to discover the most effective coping strategies for each individual and ultimately manage the detrimental effects of stress and anxiety for all.

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# Appendices

## Appendix A

### Informed Consent Statement

**Study Title:** The effect of group membership on a cognitive task

**Experimenter:** Michaela Whelan

**Description of Experiment:** Participants will be assigned to one of two groups and will be asked to engage in a cognitive task, where the experimenter will investigate whether membership of a certain group will affect their results in the task.

In order to participate in this research study, it is necessary that you give your informed consent. By clicking the "I agree" button, you are indicating that you understand the nature of the research study and your role in that research and that you agree to participate in the research. Please consider the following points before signing:

- I understand that I am participating in psychological research.
- I understand that my identity will not be linked with my data, and that all information I provide will remain confidential.
- I understand that participation involves completing a 40–50-minute experiment which will consist of completing a cognitive task, two sets of short scales and a small questionnaire.
- I understand that I will be provided with an explanation of the research in which I participated and be given the name and telephone number of an individual to contact if I have questions about the research. In addition, I understand that I may contact the researcher Michaela Whelan, if I have questions concerning my rights as a participant in psychological research or to report a research-related injury.
- I understand that certain facts about the study might be withheld from me, and the researchers might not, initially, tell me the true or full purpose of the study. However, the complete facts and true purpose of the study will be revealed to me at the completion of the study session.
- I understand that participation in research is not required, is voluntary, and that, after any individual research project has begun, I may refuse to participate further without penalty.

**By clicking the "I agree" button below you are confirming that you have read the above information and that you would like to participate. You are also acknowledging that you are 18 years or older.**

**I agree** □

## Appendix B

## Study Information Sheet

***Title:*** The effect of group membership on a cognitive task

### *Introduction to the study*

Before you decide to participate in this study, it is vital for you to understand why this research is being conducted and what the process involves for you. Please take the time out of your day to read the information carefully. If you have any questions do not hesitate to contact the researcher. Then consider if you wish to take part. Thank you.

### *Purpose of the study*

As a final year student in the undergraduate Psychology programme at National College of Ireland, I must carry out an independent research project, as part of my degree. This study is being conducted in order investigate whether membership of a certain group will affect their results in a cognitive task. This project will be supervised by Dr. April Hargreaves. The outcomes of this research could be beneficial to society and can potentially have an impact on yourself as an individual.

### *When will this study take place?*

The study will take place virtually on the $10^{th}/11^{th}$ of December 2020. There will be two timeslots, depending on what group you are assigned to. You will be contacted via email and informed of your time slot.

### *What will taking part in this study involve?*

You will be asked to virtually attend an experimental testing session, via Microsoft teams. On the day of the study your group will be welcomed and given instructions regarding the task. You will be asked to complete a cognitive task, as part of the experiment and fill out short scales before and after the task. These scales will be accessed via Google Forms. The online session is expected to last 40 minutes.

***Who can take part?***

Participants can take part in this study if they are over the age of 18 and have access to the internet for the experiment.

***Do I have to take part?***

Taking part in this study is entirely voluntary and refusing to take part will involve no consequences or penalty, now or in the future. You can withdraw from the study at any time up until the point you submit your completed questionnaire/scales on google forms.

***Are there possible disadvantages and/or risks in taking part?***

As the cognitive task involves some speaking, participants may feel some level of distress and worry. However, participants can withdraw from the experiment at any time up until they hit submit on Google forms at the end.

***What are the possible benefits of taking part?***

This study can potentially impact your life and help make the everyday stuff that you encounter more manageable.

***Will my taking part in this project be kept confidential?***

All personal information collected will be kept strictly confidential. All data will be anonymized. Data will be stored securely and in a way that attends to the participants right of privacy, as agreed by informed consent.

***What will happen to the results of the research project?***

Results will go towards the researcher's thesis. Results are generally presented in terms of groups of individuals. However, if any individual data is presented, the data will be totally anonymous.

***Ethical review of the study***

The project has been reviewed by the NCI Psychology Research Ethics Committee.

***Who do I contact for further information?***

Researcher: Michaela Whelan

Email: x18353306@student.ncirl.ie

Supervisor: Dr. April Hargreaves

Email: April.Hargreaves@ncirl.ie

## Appendix C

***Study: The effect of relaxing music on self-reported anxiety and stress.***

### *Study Debriefing*

This study is concerned with the effect of relaxing music on perceived stress and anxiety. This study also aimed to investigate if females reported higher levels of stress than men.

### *How was this tested?*

This was tested by separating participants into two groups – the relaxing music group and no music group. Scores on both scales (State-trait anxiety scale and Perceived Stress Scale) indicated levels of anxiety and stress. Both groups (relaxing music and no music) anxiety/stress scores were compared. A demographic questionnaire was utilized in order to assess if gender influenced self-reported stress levels.

### *What did this research expect to find?*

This study expected **r**elaxing music to cause a reduction in self-reported anxiety and stress levels, after the exposure to the stressor, when comparing it to the no music group. It also expected gender to impact stress levels.

### *Why is this important to study?*

Relaxing music has been shown to effect stress and anxiety levels. Lower stress and anxiety levels are linked to better overall individual health. More research was needed to ensure that relaxing music had this same effect on the general population rather than just patients and students. Also, further research was needed due to past methodological issues.

### *Confidentiality*

All information which you provided throughout the study will remain anonymous and your information will not be identifiable. The results acquired in this study will be submitted to The National College of Ireland for my final year thesis.

***If you are experiencing distress as a result of participation***

If you have found any part of this experience to be distressing, please do not hesitate to contact the researcher: Michaela Whelan, email: x18353306@ncirl.ie.

Also, there are a number of organisations listed below that you can contact.

| **Organisations** | **Phone** |
|---|---|
| Samaritans Ireland | 116 123 |
| Aware | 1800 80 48 48 |
| Mental Health Ireland | 01 284 1166 |

Thanks again for your time and participation.

**Appendix D**

## STAI FORM X-1

| | Not at all | Somewhat | Moderately so | Very much so |
|---|---|---|---|---|
| 1. I feel calm ..... | 1 | 2 | 3 | 4 |
| 2. I feel secure ..... | 1 | 2 | 3 | 4 |
| 3. I am tense ..... | 1 | 2 | 3 | 4 |
| 4. I am regretful ..... | 1 | 2 | 3 | 4 |
| 5. I feel at ease ..... | 1 | 2 | 3 | 4 |
| 6. I feel upset ..... | 1 | 2 | 3 | 4 |
| 7. I am presently worrying about possible misfortunes ..... | 1 | 2 | 3 | 4 |
| 8. I feel rested ..... | 1 | 2 | 3 | 4 |
| 9. I feel anxious ..... | 1 | 2 | 3 | 4 |
| 10. I feel comfortable ..... | 1 | 2 | 3 | 4 |
| 11. I feel self-confident ..... | 1 | 2 | 3 | 4 |
| 12. I feel nervous ..... | 1 | 2 | 3 | 4 |
| 13. I am jittery ..... | 1 | 2 | 3 | 4 |
| 14. I feel "high strung" ..... | 1 | 2 | 3 | 4 |
| 15. I am relaxed ..... | 1 | 2 | 3 | 4 |
| 16. I feel content ..... | 1 | 2 | 3 | 4 |
| 17. I am worried ..... | 1 | 2 | 3 | 4 |
| 18. I feel over-excited and rattled ..... | 1 | 2 | 3 | 4 |
| 19. I feel joyful ..... | 1 | 2 | 3 | 4 |
| 20. I feel pleasant..... | 1 | 2 | 3 | 4 |

**Appendix E**

**Perceived Stress Scale**

**0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often**

1. In the last month, how often have you been upset because of something that happened unexpectedly?

0 1 2 3 4

2. In the last month, how often have you felt that you were unable to control the important things in your life?

0 1 2 3 4

3. In the last month, how often have you felt nervous and "stressed"?

0 1 2 3 4

4. In the last month, how often have you felt confident about your ability to handle your personal problems?

0 1 2 3 4

5. In the last month, how often have you felt that things were going your way?

0 1 2 3 4

6. In the last month, how often have you found that you could not cope with all the things that you had to do?

0 1 2 3 4

7. In the last month, how often have you been able to control irritations in your life?

0 1 2 3 4

8. In the last month, how often have you felt that you were on top of things?

0 1 2 3 4

9. In the last month, how often have you been angered because of things that were outside of your control?

0 1 2 3 4

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

0 1 2 3 4

**Appendix F**

https://youtu.be/H3v9unphfi0