The Second International Conference
Psychology and Music – Interdisciplinary Encounters

(PAM-IE Belgrade 2022)

Main Conference Program, October 26–29, 2022

Parallel Conference Program, October 27, 2022

Main Organizer
Faculty of Music, University of Arts in Belgrade

Co-organizers
Institute of Psychology, Faculty of Philosophy, University of Belgrade
Psychology of Music Section, Serbian Psychological Society
Regional Network Psychology and Music (RNPaM)

How to cite this volume
Bogunović, B., Nikolić, S., & Mutavdžin, D. (Eds.). (2023). *Proceedings of the PAM-IE Belgrade 2022*. Faculty of Music, University of Arts in Belgrade.

Proceedings of the Second International Conference
Psychology and Music – Interdisciplinary Encounters, Belgrade 2022

Editors
Blanka Bogunović, Sanela Nikolić, and Dejana Mutavdžin

Publisher
Faculty of Music, University of Arts in Belgrade, Kralja Milana 50, Belgrade

For publisher
Faculty of Music
Ljiljana Nestorovska

Editor-in-Chief of the Faculty of Music Publications
Gordana Karan

Cover design
Stefan Ignjatović

Technical Editor and Pre-Press
Dušan Ćasić

ISBN-978-86-81340-59-2

PAM-IE Belgrade 2022 Conference and this publication were supported by
the Ministry of Science, Technological Development and Innovation of the Republic of Serbia.

THE SECOND INTERNATIONAL CONFERENCE

Psychology and Music – Interdisciplinary Encounters

PROCEEDINGS

Editors
Blanka Bogunović, Sanela Nikolić, and Dejana Mutavdžin

Faculty of Music, University of Arts in Belgrade, 2023

Adolescents' Music Listening for Relaxation: Subjective and Physiological Effects

Gulnara Minkkinen[1], Suvi Saarikallio[2], Josefiina Pajunen[3], and Esa Ala-Ruona[4]

[1,2,3,4] *Department of Music, Art and Culture Studies, University of Jyväskylä, Finland*

[1]gulnara.g.minkkinen@jyu.fi, [2]suvi.saarikallio@jyu.fi, [3]jospajunen@gmail.com, [4]esa.ala-ruona@jyu.fi

Abstract

Music is a common resource for self-regulation that is actively used by young people, but relatively few studies have empirically investigated adolescents' use of music for relaxation. This study aimed to investigate whether self-selected music can facilitate relaxation in adolescents on both subjective and physiological levels. Twenty-six adolescents participated in two 20-minutes long individual relaxation sessions: one with self-selected relaxation music and one without music. For the No Music condition, participants were provided with magazines to read. The heart rate variability (HRV) was measured throughout the experiment, and subjective reports of Valence, Arousal, and Tension were collected with visual analog scales before and after each relaxation session. All participants underwent both conditions. A year later, the experiment was repeated with the same participants. Repeated Measures ANOVA (RM ANOVA) of the HRV parameters revealed that both Music and No Music conditions led to a significant increase in both parameters in both years, indicating a relaxation response. However, no difference between the conditions was found. Subjective ratings were analyzed using Wilcoxon Signed-Rank test, and analysis showed a significant increase in valence for both conditions and years and a decrease in tension for the Music condition in both years. Arousal scores, however, increased insignificantly for Music condition, indicating that some participants felt more energetic after relaxation with music. Participants felt significantly less tense after Music than after No Music condition in the second year. Overall, results stayed consistent throughout both years. Further research that utilizes a combination of physiological and self-report measures is needed to achieve a comprehensive knowledge of musical experiences.

Introduction

Adolescents actively use music for different self-regulation purposes (Saarikallio & Erkkilä, 2007; Wells & Hakanen, 1991) and one of such processes that can be assisted with music is relaxation (van Goethem & Sloboda, 2011). Relaxation is often defined as a state of reduced arousal and tension (American Psychological Association Dictionary of Psychology, 2021). However, relaxation psychology researcher Smith (2007) suggested 12 relaxation states varying from sleepy to energetic, which can be divided into 4 groups: basic relaxation, core mindfulness, positive energy, and transcendence.

While music listening has been identified as a common and important source for adolescents' relaxation, little is known about how efficiently music promotes relaxation and self-regulation in adolescents on the levels of physiological measures and subjective experiences. Subjective experiences of adolescents' music-facilitated relaxation were studied earlier by Saarikallio et al. (2017). They suggested that affect is the core element of music-facilitated relaxation, with mood improvement and positive emotions typically being perceived as outcomes of music-facilitated relaxation.

Effects of music on stress reduction (Helsing et al., 2016; Kreutz et al., 2004) have been shown in various physiological measures. The physiological side of relaxation is associated with the dominance of the parasympathetic branch of the autonomic nervous system (ANS) over the sympathetic branch. One measure commonly used in relaxation research is Heart Rate Variability (HRV). HRV refers to the variability of

the intervals between heartbeats or beat-to-beat variability. It can index parasympathetic activity and therefore is often used as a physiological correlate of stress and relaxation states (Kim et al., 2018; Laborde et al., 2017; Pieper et al., 2007).

Both self-selected (e.g., Labbé et al., 2007; Lingham & Theorell, 2009) and researcher-selected relaxation music (e.g., Fallon et al., 2020; Lilley et al., 2014; Thoma et al., 2013) has been used in stress and relaxation research. While some favor researcher-selected music (Pelletier, 2004), other researchers (Davis & Thaut, 1989; Yehuda, 2011) highlight the role of preference and familiarity for relaxation music. Labbé et al. (2007) point out that self-selected music gives participants a sense of control, which is an important factor for a relaxation study. Moreover, self-selected music allows researchers to create a more ecological setting by making the experimental situation closer to the everyday life situations when adolescents use music for self-regulation.

Aims

The main aim of the current study was to investigate whether listening to self-selected relaxation music promotes relaxation in adolescents on the levels of physiological measures and subjective experiences. The subjective experience was addressed as changes in Valence, Arousal, and Tension to capture the different aspects of subjective affective experience. The research questions were as follows:

1) Does self-selected music promote relaxation (at both subjective and physiological levels) in adolescents?
2) Does music listening promote relaxation better than relaxation without music?

Based on previous research, we hypothesized first that listening to self-selected relaxing music would result in an increase of self-reported Valence and in a decrease of self-reported Tension, Arousal, and physiological stress (as measured by HRV). Second, we expected these effects to be stronger in the Music listening condition than in the No Music condition. To check for the consistency of the results the study was repeated with the same participants after a period of 1 year and a year comparison was added to ensure the reliability of the results.

Method

Recruitment and Participants

Adolescents (15–16 years old girls and boys) living in Jyväskylä, Finland, took part in the study in 2012 and in 2013 (later referred to as Year 1 and Year 2). Recruitment was conducted in local schools. Volunteers, as well as their guardians, were thereafter contacted for more detailed informed consent, prior to any data collection. Participants' guardians provided consent in written form. The Ethical Board of the University of Jyväskylä approved the study. Participants reported smoking, alcohol and medication intake, and possible heart conditions to check for exclusion criteria for HRV measurements. Participants who reported smoking during the experiment day or taking cardioactive medication were removed from the sample. The final sample, after applying exclusion criteria mentioned above, consisted of the following: $N = 26$, 18 female, 8 male, with all participants being 15 years old in Year 1 and 16 years old in Year 2.

Procedure and Design

An experiment with a within-subject design and 2 conditions (Music and No Music) was conducted. At the start of the experiment, participants were given the HRV monitors and instructions. Participants were seated on a sofa in a quiet room and were asked to take a 20-minute relaxation. For the Music condition, participants were asked to listen to music they had chosen to support their relaxation using their own device and headphones on a comfortable volume level. In the absence of a personal device, a player and headphones were provided. For the No Music condition, participants were provided with magazines to read while relaxing. Participants reported their subjective Va-

lence, Arousal, and Tension before and after the relaxation. Each participant took part in both conditions. Both experimental sessions took place on the same day with a few hours break in between. The order of conditions was counterbalanced to avoid the carryover effect. A year later, the experiment was repeated with the same participants to check the consistency of the results and to find out if the same patterns in participants' responses would emerge.

Subjective Outcome Measures

Participants were asked to report their current state before and after each condition by rating 3 parameters using a 9-point Likert scale. The question was formulated as "How are you feeling at the moment?". The parameters rated were Valence (1 – *unpleasant*, 9 – *pleasant*); Arousal (1 – *sleepy*, 9 – *energetic*), Tension (1 – *tense*, 9 – *relaxed*, so higher score means lower Tension).

HRV Data Sources and Parameters

Heart Rate Variability (HRV) was measured continuously during the experiment day (9am–3pm). Measures were conducted using the heart rate monitors Bodyguard and ECG electrodes. The heart rate monitors and the software are produced by Firstbeat Technologies Oy. Kubios HRV Standard 3.4.3 software (2020) was used to process the HRV data. For this study, the time points of analysis were the following: 5-minutes long Baseline measurements prior to all relaxation sessions (participants were seated) and 20-minutes long Experiment measurement (either Music or No Music condition).

HRV can be assessed through different parameters, and in this study, we used the Parasympathetic Nervous System Index (PNS Index) and RMSSD. Both parameters were calculated in Kubios software. PNS Index is a complex parameter that allows measuring the effects of parasympathetic activity. Parasympathetic activity decreases heart rate, increases HRV due to the enhanced respiratory sinus arrhythmia (RSA) component, and decreases the ratio between lower and higher frequency oscillations in HRV time series (Kubios, 2021). The parameter consists of the Mean RR (to capture a decrease in heart rate), Root Mean Square of Successive RR interval Differences (RMSSD, to detect beat-to-beat changes and changes in RSA), and Poincaré plot index SD1 in normalized units (as a correlate of a sympathovagal balance of the ANS).

The RMSSD was also analyzed separately as the time-domain HRV parameter that reflects vagal tone (Kim et al., 2018; Laborde et al., 2017). Vagal tone is an internal biological process that reflects the activity of the vagus nerve, which is strongly associated with parasympathetic activity in general and, thus, with recovery processes. We used the natural logarithm transformation of the RMSSD (lnRMSSD) as it is advised to correct the lack of normality of the data (Laborde et al., 2017). Analyzing the PNS Index allows us to get a more comprehensive picture of the participants' parasympathetic activity and including a more traditional parameter as lnRMSSD helps us to build connections to the previous research in the field. In both parameters, higher measurements indicate a stronger relaxation response. Artifacts were removed using the Kubios artifact detection and removal feature at the stage of pre-processing. Smoothness priors ($\lambda = 500$) were applied to detrend the data and ensure its stationarity.

Results

Subjective Ratings: Self-reported Valence, Arousal, and Tension

Figure 1 shows that, in line with our hypotheses, participants reported feeling happier and less tense after both conditions in both years. However, when it comes to Arousal (Figure 1), participants reported feeling slightly more energized after Music and sleepier after No Music conditions in both years, but the difference is minor.

The data were not normally distributed, so the Wilcoxon Signed-Rank test was performed and showed significant differences between Be-

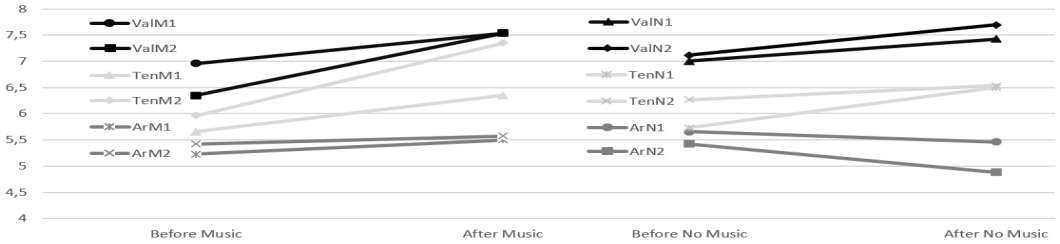

Figure 1. Mean Valence, Arousal and Tension for Music and No Music conditions in Year 1 and in Year 2.

Note. Val – Valence, Ar – Arousal, Ten – Tension; BM – Before Music condition, BN – Before No Music condition, AM – After Music condition, AN – After No Music condition; 1 – measurement taken in Year 1, 2 – measurement taken in Year 2. Higher Tension score means *lower* experienced tension**.**

fore and After the experiment in Valence (both conditions, both years) and Tension for the Music condition in both years (Tension is a reverse scale, higher score means *lower* tension). The change for No Music condition was borderline significant (p = .05) in Year 1 and insignificant in Year 2 (Table 1). No significant differences in Arousal were found. The results thus support our hypothesis about the impact of music listening on subjective Valence and Tension, but not on Arousal. To see possible differences between the 2 conditions, changes between Before and After-timepoints were calculated for each participant, condition, and parameter (Valence, Arousal, Tension).

The data were not normally distributed, so a Wilcoxon S-R test was conducted to see if the differences in changes were statistically significant. The analysis revealed that a significant difference occurred for the Tension score in Year 2: Tension score rose significantly greater after Music (*Mdn* = 1) than after No Music (*Mdn* = 0.5) in Year 2 (p = .01, Z = -2.55), which means that participants felt significantly less tense after Music condition than after No Music. Yearwise, no significant difference was found.

We analyzed 2 HRV parameters to get a deeper insight into participants' autonomic nervous system state during both conditions. See Mean and SD in Table 2. For the PNS Index, positive score refers to the relaxation state, negative score, on the other hand, refers to stress. For the lnRMSSD, higher scores indicate a stronger relaxation response.

Table 1. Results of Wilcoxon S-R test for self-reports of Valence, Tension, and Arousal.

	Music	**No Music**
Valence Year 1	After Music (*Mdn* = 8) > Before (*Mdn* = 7), p = .02, Z = -2.28	After No Music (*Mdn* = 8) > Before (*Mdn* = 7), p = .02, Z = -2.39
Valence Year 2	After Music (*Mdn* = 8) > Before (*Mdn* = 7), p = .002, Z = -3.16	After No Music (*Mdn* = 8) > Before (*Mdn* = 7), p = .002, Z = -3.12
Tension Year 1	After Music (*Mdn* = 7) > Before (*Mdn* = 6), p = .01, Z = -2.46	After No Music (*Mdn* = 7) > Before (*Mdn* = 6), p = .05, Z = -1.97
Tension Year 2	After Music (*Mdn* = 8) > Before (Mdn = 6), p = .001, Z = -3.38	After No Music (*Mdn* = 7) > Before (*Mdn* = 7), p = .28, Z = -1.08

The Heart Rate Variability (HRV) results

Repeated Measures ANOVA was conducted to identify possible differences between Music and No Music conditions in Year 1 and Year 2 for the PNS Index and lnRMSSD. Three within-subject factors were used: Time (Baseline and Experiment), Condition (Music and No Music),

and Year (Year 1 and Year 2). For the PNS Index, the main effect of Time (Baseline and Experiment) was significant: $F(1, 25) = 38.73$, $p < .001$, partial $\eta^2 = .61$. Similarly, for lnRMSSD the main effect of Time was significant: $F(1, 25) = 24.49$, $p < .001$, partial $\eta^2 = .5$. No other main or interaction effect was found significant for any of the parameters, thus, no significant differences between the conditions were found. Pairwise comparison with *t*-test revealed significant differences between each Baseline-Experiment pair, so differences between Baseline and Experiment were found significant for both conditions in both years for both parameters (Table 2).

Table 2. Mean, Standard Deviation and t-test results for the HRV parameters.

Pair	Result
Music Year 1	PNS Index: Experiment (M = -0.04, SD = 1.15) > Baseline (M = -0.63, SD = 0.87); $t(25)$ = -3.92, p = .001, Cohen's d = 0.96
No Music Year 1	PNS Index: Experiment (M = 0.25, SD = 1.31) > Baseline (M = -0.48, SD = 0.99); $t(25)$ = -3.99, p = .001, Cohen's d = 0.93
Music Year 2	PNS Index: Experiment (M = -0.05, SD = 1.12) > Baseline (M = -0.77, SD = 1.05); $t(25)$ = -5.82, $p < .001$, Cohen's d = 0.63
No Music Year 2	PNS Index: Experiment (M = 0.42, SD = 1.36) > Baseline (M = -0.62, SD = 1.26); $t(25)$ = -4.61, $p < .001$, Cohen's d = 1.15
Music Year 1	lnRMSSD: Experiment (M = 3.99, SD = 0.42) > Baseline (M = 3.83, SD = 0.42); $t(25)$ = -2.86, p = .008, Cohen's d = 0.28
No Music Year 1	lnRMSSD: Experiment (M = 4.14, SD = 0.51) > Baseline (M = 3.92, SD = 0.47); $t(25)$ = -3.12, p = .004, Cohen's d = 0.36
Music Year 2	lnRMSSD: Experiment (M = 3.99, SD = 0.47) > Baseline (M = 3.86, SD = 0.55); $t(25)$ = -2.36, p = .03, Cohen's d = 0.3
No Music Year 2	lnRMSSD: Experiment (M = 4.18, SD = 0.54) > Baseline (M = 3.88, SD = 0.59); $t(25)$ = -3.52, p = .002, Cohen's d = 0.43

To further investigate the possible differences between the conditions, the changes from Baseline to Experiment were calculated and compared with the *t*-test. However, no significant differences between the conditions were found for any of the measures.

As expected, the results for both analyzed parameters align: the main effect of Time was significant across both parameters. *t*-test for the Baseline-Experiment pairs showed the significant differences between Baseline and Experiment for both conditions in both years for both parameters. However, no significant difference between the conditions was found.

Discussion

This study aimed to increase understanding of whether self-selected music could facilitate relaxation in adolescents. Music-facilitated relaxation helped participants to improve mood (as measured with Valence scale) and reduce tension, but some participants experienced feeling rather more energetic than sleepy after it. Physiologically, most participants were more relaxed during the music listening than before. When compared to the control No Music condition, during which participants were reading magazines, adolescents reported feeling significantly less tension after Music condition in Year 2 than after No Music. On the physiological level, there was no statistically significant difference between the conditions.

Our results indicate that music-facilitated relaxation helped reduce subjective tension better than active control (reading magazines). However, against our expectations, music did not reduce participants' arousal. It may be that music-facilitated relaxation is psychologically mood-improving and tension reducing yet reviving and for some even energizing and arousal-increasing. The combination of increase in positive emotions and energy and decrease in tension aligns with the regulatory strategy Revival described in Saarikallio et al. (2007). Self-selected music might have been one other factor that could have affected the ambiguous

Arousal ratings. Research has shown that preferred music is associated with increase in subjective arousal (Radstaak et al., 2014; Salimpoor et al., 2009; Schafer & Sedmeier, 2011). This aligns with Lingham and Theorell's (2009) conclusion that, even if the music can be classified as relaxing, it can still increase arousal if one is familiar with it and likes it.

Finally, it is important to discuss the understanding of music-facilitated relaxation as a phenomenon. As mentioned earlier, Smith (2007) describes 12 types of relaxation states that vary from sleepy to energetic. Based on our results, we can assume that music-facilitated relaxation, especially with preferred music, might belong to the category 'positive energy' that includes such relaxation states as joyful and optimistic (Smith, 2007). Such states can be characterized with reduced tension and higher valence, but they do not include low arousal.

Limitations and Suggestions for Future Research

The sample size of the current study is small, so our conclusions are not necessarily generalizable. Participants in the current study were 15-16-year-old boys and girls living in Jyväskylä, Finland. Thus, we cannot claim that the same conclusions are applicable to other populations. Also, most participants (18 out of 26) were girls. We used HRV as a physiological measure of relaxation, which is commonly used in stress and relaxation research. However, HRV is methodologically sensitive to a high number of individual factors affecting the measurement result. Experiments should therefore be conducted in a controlled environment, which is less ecologically valid. Future research could also include stress induction activities to see the relaxation effects more clearly.

Conclusion

The concept of music-facilitated relaxation may be more complex than what is commonly considered, particularly in relation to the arousal dimension. This creates a need for further research to carefully consider how to conceptualize and operationalize music-facilitated relaxation. Also, further research that utilizes a combination of physiological and self-report measures is needed to achieve a comprehensive knowledge of musical experiences.

Acknowledgements. We thank Markku Pöyhönen and Marianne Tiihonen for their help during the data collection.

References

American Psychological Association Dictionary of Psychology. (2021, December 16). *Relaxation*. APA. https://dictionary.apa.org/relaxation

Davis, W. B., & Thaut, M. H. (1989). The influence of preferred relaxing music on measures of state anxiety, relaxation, and physiological responses. *Journal of Music Therapy*, *26*(4), 168–187. https://doi.org/10.1093/jmt/26.4.168

Fallon, V. T., Rubenstein, S., Warfield, R., Ennerfelt, H., Hearn, B., & Leaver, E. (2020). Stress reduction from a musical intervention. *Psychomusicology: Music, Mind, and Brain*, *30*(1), 20–27. https://doi.org/10.1037/pmu0000246

Helsing, M., Västfjäll, D., Bjälkebring, P., Juslin, P. N., & Hartig, T. (2016). An experimental field study of the effects of listening to self-selected music on emotions, stress, and cortisol levels. *Music and Medicine, an Interdisciplinary Journal*, *8*(4), 187–198. https://doi.org/10.47513/mmd.v8i4.442

Kim, H.-G., Cheon, E.-J., Bai, D.-S., Lee, Y. H., & Koo, B.-H. (2018). Stress and heart rate variability: A meta-analysis and review of the literature. *Psychiatry Investigation*, *15*(3), 235–245. https://doi.org/10.30773/pi.2017.08.17

Kreutz, G., Bongard, S., Rohrmann, S., Hodapp, V., & Grebe, D. (2004). Effects of choir singing or listening on secretory immunoglobulin A, cortisol and emotional state. *Journal of Behavioural Medicine*, *27*(6), 623–635. https://doi.org/10.1007/s10865-004-0006-9

Kubios. (2021, September 20). *HRV in evaluating ANS function.* https://www.kubios.com/hrv-ans-function/

Kubios. (2022, January 2021). *Kubios HRV standard 3.4.3*. https://www.kubios.com/hrv-standard/

Kuppens, P. (2008). Individual differences in the relationship between pleasure and arousal. *Journal of Research in Personality*, *42*(4), 1053–1059. https://doi.org/10.1016/j.jrp.2007.10.007

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

Laborde, S., Mosley, E., & Thayer, J. F. (2017). Heart rate variability and cardiac vagal tone in psychophysiological research – Recommendations for experiment planning, data analysis, and data reporting. *Frontiers in Psychology*, *8*, Article 213. https://doi.org/10.3389/fpsyg.2017.00213

Lilley, J. L., Oberle, C. D., & Thompson, J. G., Jr. (2014). Effects of music and grade consequences on test anxiety and performance. *Psychomusicology: Music, Mind, and Brain*, *24*(2), 184–190. https://doi.org/10.1037/pmu0000038

Lingham, J., & Theorell, T. (2009). Self-selected 'favourite' stimulative and sedative music listening – How does familiar and preferred music listening affect the body? *Nordic Journal of Music Therapy*, *18*(2), 150–166. https://doi.org/10.1080/08098130903062363

Pelletier, C. L. (2004). The effect of music on decreasing arousal due to stress: A meta-analysis. *Journal of Music Therapy*, *41*(3), 192–214. https://doi.org/10.1093/jmt/41.3.192

Pieper, S., Brosschot, J. F., van der Leeden, R., & Thayer, J. F. (2007). Cardiac effects of momentary assessed worry episodes and stressful events. *Psychosomatic Medicine*, *69*(9), 901–909. https://doi.org./10.1097/PSY.0b013e31815a9230

Radstaak, M., Geurts, S. A. E., Brosschot, J. F., & Kompier, M. A. J. (2014). Music and psychophysiological recovery from stress. *Psychosomatic Medicine*, *76*(7), 529–537. https://doi.org/10.1097/psy.0000000000000094

Saarikallio, S., Baltazar, M., & Västfjäll, D. (2017). Adolescents' musical relaxation: Understanding related affective processing. *Nordic Journal of Music Therapy*, *26*(4), 376–389. https://doi.org/10.1080/08098131.2016.1276097

Saarikallio, S., & Erkkilä, J. (2007). The role of music in adolescents' mood regulation. *Psychology of Music*, *35*(1), 88–109. https://doi.org/10.1177/0305735607068889

Salimpoor, V. N., Benovoy, M., Longo, G., Cooperstock, R. J., & Zatorre, R. J. (2009). The rewarding aspects of music listening are related to degree of emotional arousal. *PLOS ONE, 4*(10), Article e7487. https://doi.org./10.1371/journal.pone.0007487

Schäfer, T., & Sedlmeier, P. (2011). Does the body move the soul? The impact of arousal on music preference. *Music Perception*, *29*(1), 37–50. https://doi.org/10.1525/mp.2011.29.1.37

Smith, J. C. (2007). The psychology of relaxation. In P. M. Lehrer, R. L. Woolfolk, & W. E. Sime (Eds.), *Principles and practice of stress management* (pp. 38–52). The Guilford Press.

Thoma, M. V., La Marca, R., Brönnimann, R., Finkel, L., Ehlert, U., & Nater, U. M. (2013). The effect of music on the human stress response. *PLOS ONE*, *8*(8), Article e70156. https://doi.org/10.1371/journal.pone.0070156

van Goethem, A., & Sloboda, J. A. (2011). The functions of music for affect regulation. *Musicae Scientiae*, *15*(2), 208–228. https://doi.org/10.1177/1029864911401174

Wells, A., & Hakanen, E. A. (1991). The emotional use of popular music by adolescents. *Journalism & Mass Communication Quarterly*, *68*(3), 445–454. https://doi.org/10.1177/107769909106800315

Yehuda, N. (2011). Music and stress. *Journal of Adult Development*, *18*(2), 85–94. https://doi.org/10.1007/s10804-010-9117-4