

## Sonic emotion: variability of perception based on context and state

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**Abstract:** *The study explored the momentary emotional disposition of 71 subjects (average age 23.2 years) by exposing them to six songs from different eras. Participants were asked to describe the emotions or feelings evoked by each song immediately after listening. This process was repeated after a 4-month interval, using the same songs in the same order to assess changes in emotional perception. Results indicated that in more than half of the cases, subjects provided different responses in the two stages of the study. This phenomenon suggests that emotional reactions to the respective songs were significantly influenced by the subjects' mood at the time of listening.*

Key-words: *momentary emotions, perception, reaction*

### 1. Introduction

Music's ability to evoke emotions has been a subject of fascination and inquiry for scholars and researchers alike. While the dynamic interplay between music and emotion is well-established, this study seeks to delve deeper into the temporal dimension of emotional responses.

By examining the momentary emotional disposition of individuals over a 4-month interval, our aim is to unravel the complex relationship between music, emotion, and the influence of contextual factors.

Music has been an integral part of human culture for millennia, and its ability to evoke emotions has been a subject of fascination and study across various disciplines (Zentner et al., 2008). We explore several scientific articles that shed light on the mechanisms through which music influences emotions.

Previous research has extensively explored the link between music and emotion, acknowledging the intricate and subjective nature of this interaction (Kawakami et al., 2013). Studies have emphasized the role of musical elements, such as tempo, pitch, and melody, in shaping emotional responses. Additionally,

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the influence of individual differences and contextual factors on emotional experiences has been acknowledged.

Neuroimaging techniques like fMRI and PET offer insights into the neural correlates of music-evoked emotions, bridging the gap between psychological understanding and physiological responses (Schaefer 2017).

Spatiotemporal connectionist models demonstrate their efficacy in capturing and generalizing emotional responses to music, shedding light on the underlying mechanisms of emotional engagement (Coutinho and Cangelosi 2006).

Specific musical attributes play a pivotal role in eliciting distinct emotional responses, with cross-cultural influences shaping individuals' interpretations of music's emotional content (Thomson and Quinto 2014).

The subtle influence of musical tempo on physiological responses, particularly heart rate, underscores the multifaceted nature of music's impact on the human body (Aburto-Corona et al. 2021).

Experimental findings reveal how musical cues such as tempo and rhythmic unit modulate emotional states, providing valuable insights for music therapy and mood regulation. (Fernández-Sotos et al. 2016)

Theoretical frameworks highlight music's capacity to resonate with fundamental cognitive and motor processes, emphasizing its role in synchronizing psychological mechanisms and eliciting profound emotional effects. Given that music serves as a conduit for emotions, it's especially crucial to identify the emotional cues within musical pieces (Han et al. 2022).

Research indicates that music characterized by a brisk tempo tends to elicit upbeat emotions whereas compositions with a slower tempo are more commonly associated with somber feelings (Peretz et al. 1998; Balkwill and Thompson 1999; Juslin and Sloboda 2001).

Music psychologists investigate the connections between music and emotion (Swaminathan and Schellenberg 2015). However, there is a gap in the literature regarding how emotional responses to music may evolve over time and whether there are persistent emotional impacts associated with specific musical compositions.

## **2. Methodology**

Participants in this longitudinal study were 71 individuals with an average age of 23.2 years. The study involved exposing participants to six songs from different eras and prompting them to describe the emotions in one word immediately after listening. This process was repeated after a 4-month interval, utilizing the same songs in the same order. The goal was to capture changes in emotional perception over time.

Out of the 6 songs, 4 were from the international repertoire, pop music, songs that are present on radio stations of this genre, and 2 songs from the international classical (“Spring” by A. Vivaldi) and national (“Balada” by C. Porumbescu) repertoire. The song’s names and the performers were said after the audition of each song. Three out of the four pop songs had a tempo of andante, while one had a tempo of allegro. The classical songs had tempos of allegro and adagio. The subjects included in the experiment were first-year master’s students in the Physical Therapy: Motor Recovery and Reeducation program, having completed their bachelor’s degrees in physical education and sports or physical therapy.

The message conveyed by the words used in the heard melodies varied. The songs were sung in English, while all study participants were native speakers of the Romanian language. Besides those from the classical repertoire, which had no lyrics, the others were about love, honoring the beloved person, forgiveness, hope, and sadness. We interpreted the received responses based on the tempo of the melody, searching for similarities or differences in the two answers provided by the research subjects.

### 3. Results and Discussion

For the first song (*Spring* by A. Vivaldi) words such as “speed”, “harmony”, “narrative”, “elegance”, “happiness”, “peace”, and “spring” appear in both sets of responses, indicating consistency in emotional perception across the two testing times. While some words like “harmony” and “peace” remain consistent, there are noticeable differences in the second set of responses, with new words such as „nature”, „emotion”, “beauty”, and “enthusiasm” emerging, suggesting an evolution or shift in emotional perception over time.

The emergence of words like “nature”, „emotion”, and “beauty” in the second set of responses suggests a deeper and more nuanced emotional engagement with the music, reflecting a broader range of emotional experiences and interpretations. Words related to positive emotions and themes such as “happiness”, “peace”, and “spring” persist across both sets of responses, indicating the enduring emotional impact of the music and its thematic consistency.

Overall, the comparison reveals both consistency and evolution in emotional responses to the music over the four-month interval. While certain emotions and themes remain consistent, new emotional nuances and interpretations emerge over time, reflecting the dynamic and multifaceted nature of the participants’ emotional experiences.

The second song was by artist Kravitz L. *I belong to you* which has 87 beats per minute (Andante).

The first set of words evokes a wide range of emotions, including “sensuality”, “happiness”, “sadness”, and “nostalgia”, suggesting a diverse and complex emotional response to the music. In contrast, the second set of words primarily reflects positive emotions such as “happiness”, “joy”, and “vitality”, along with themes of “harmony”, “balance”, and “elegance”. This shift indicates a more upbeat and harmonious interpretation of the music over time. While there is a noticeable shift in emotional tone between the two sets of words, some themes persist across both auditions. For instance, words like „harmony”, „happiness”, and „cheerfulness” appear in both sets, suggesting a consistent appreciation for elements of harmony and joy in the music.

The second set of words introduces new themes such as “balance”, “suspense”, and „symphony”, indicating a deeper engagement with the music and a broader range of emotional experiences and interpretations. The shift from words like “sadness” and „melancholy” in the first set to predominantly positive words in the second set suggests a change in emotional intensity and overall mood over time.

The comparison reveals a dynamic evolution in emotional responses to the song over the four-month interval. While certain themes persist, there is a noticeable shift in emotional tone, with the second audition reflecting a more upbeat and harmonious interpretation of the music.

The third song *All around the world* by Lisa Stansfield, known for its soulful vocals and infectious rhythm, resonates with listeners through its dynamic tempo of 99 Beats Per Minute (Andante). With its captivating lyrics and melodic composition, it invites audiences on a journey through emotions and experiences, reflecting the artist's versatility and depth as a performer.

The first set of words primarily evokes emotions such as “courage”, “invincibility”, “relaxation”, “sensuality”, and memories associated with themes like “vacation”, “dance”, and “adolescence”. In contrast, the second set of words reflects a broader range of emotions and themes, including “energy”, “mystery”, “well-being”, “love”, “freedom”, and “joy”. There is a noticeable shift towards positive emotions and a wider exploration of different themes. While the first set of words suggests a focus on relaxation and sensuality, with occasional mentions of courage and invincibility, the second set creates a more dynamic and varied atmosphere with words like “energy”, “mystery”, “romance”, and “freedom”. The shift from words like „courage” and „invincible” in the first set to „energy” and “well-being” in the second set suggests a change in emotional response over time, with a greater emphasis on positive emotions and well-being.

The comparison reveals a shift in emotional tone and thematic exploration between the two auditions of the song. While the first audition emphasizes relaxation and sensuality, the second audition expands the emotional palette to include a wider range of emotions and themes, creating a more dynamic and multifaceted listening experience.

The song *Stars* by *Simply Red*, characterized by its upbeat tempo of 103 beats per minute (andante), offers listeners an emotional journey filled with nostalgia, acceptance, and introspection.

The first set of words primarily evokes emotions such as nostalgia, acceptance, disappointment, and inner peace, with occasional mentions of anger and adventure. In contrast, the second set of words reflects a wider range of emotions and themes, including encouragement, motivation, sunrise, desire, dedication, and family.

There is a noticeable shift towards introspection and reflection, with a greater emphasis on inner emotional states and familial bonds. While the first set of words suggests a focus on peace, acceptance, and occasional moments of disappointment, the second set creates a more dynamic and varied atmosphere. The shift from words like “anger” and “disappointment” in the first set to “encouragement” and „motivation” in the second set suggests a change in emotional response over time, with a greater emphasis on positivity and resilience.

The comparison reveals a shift in emotional tone and thematic exploration between the two auditions of the song. While the first audition emphasizes acceptance and peace amidst nostalgia and disappointment, the second audition delves deeper into themes of encouragement, motivation, and familial bonds, reflecting a more introspective and reflective listening experience.

*Lemon Tree*, the fifth song, is a vibrant and catchy pop-rock song performed by the German band *Fool's Garden*, that has a lively tempo with approximately 143 beats per minute. With its infectious rhythm and playful vibe, “Lemon Tree” tells the story of longing and disappointment in love, wrapped in a catchy melody that leaves a lasting impression on listeners.

The first set of words primarily evokes emotions such as joy, melancholy, happiness, and positivity, with occasional mentions of discomfort and vibrancy. In contrast, the second set of words reflects a wider range of emotions and themes, including nostalgia, agitation, elegance, harmony, and peace.

There is a noticeable shift towards a more diverse emotional palette, with a greater exploration of inner states and familial connections. The evolution in emotional response is seen in the shift from words like “play” and “joy” in the first set to “good mood” and “well-being” in the second set suggests a change in emotional response over time, with a greater emphasis on inner peace and contentment.

The comparison of the two auditions reveals a shift in emotional tone and thematic exploration between the two auditions of the song. While the first audition emphasizes playfulness and joy with moments of melancholy, the second audition delves deeper into themes of nostalgia, family, and inner peace, reflecting a more introspective and reflective listening experience.

The last song is a complex opus (Ballad) by a renowned Romanian composer, C. Porumbescu. Composed in 1880, it is one of the few Romanian works of the 19th century that enjoys great popularity, stylizing elements of the Romanian *doina*, ballad, and romance and presenting them in a romantic, expressive, highly lyrical instrumental writing.

The first set of words primarily evokes emotions such as disappointment, desire, sadness, fear, and mystery, with occasional mentions of joy and elegance. In contrast, the second set of words reflects a darker and more introspective emotional landscape, with themes of pain, sadness, anger, and melancholy dominating the responses. However, there are also moments of unexplained joy and dreaming, suggesting a complexity of emotional experience. While the first set of words suggests a mix of emotions and themes, with a focus on suspense, uncertainty, and elegance, the second set creates a more somber and introspective atmosphere, with words like “pain”, “tragedy”, and melancholy prevailing. The shift from words like “disappointment” and “joy” in the first set to “pain” and “tragedy” in the second set suggests a deeper emotional response over time, with a greater emphasis on sadness and introspection.

The comparison of both sets of words reveals a shift in emotional tone and thematic exploration between the two auditions of the song.

Analysis of the data revealed intriguing patterns in the participants' emotional responses. 35% of the cases demonstrated consistency in the words used to describe emotions between the two evaluation moments.

However, in 65% of the cases, participants provided different responses in the two stages of the study. For songs with consistent responses, it can be inferred that these compositions had a persistent emotional impact on the subjects, transcending the temporal gap between assessments. On the other hand, songs with reported different responses suggest that emotional perception may vary depending on the context and the subjects' state, emphasizing the dynamic nature of emotional experiences.

In the nuanced world of music, tempo plays a crucial role in defining the character and flow of a composition.

The findings of this study contribute to our understanding of emotional responses to music by unveiling the temporal nuances in individuals' reactions. Songs with consistent emotional responses indicate a lasting impact, suggesting that certain compositions may hold enduring emotional significance. Conversely, the variability in emotional responses for some songs highlights the malleability of emotional perception, influenced by contextual factors and the subjects' current states.

Understanding how emotional responses to music unfold over time has practical implications, particularly in therapeutic settings such as music therapy. The identified patterns of emotional consistency and variability open avenues for tailored interventions, catering to individuals' evolving emotional needs.

Future research could explore the long-term impact of specific musical compositions on emotional well-being and further investigate the factors influencing emotional variability over time.

#### 4. Conclusions

In conclusion, this longitudinal study delves into the intricate dynamics of emotional responses to music, shedding light on the temporal evolution of these experiences. The findings underscore the persistence of emotional impacts associated with certain compositions while highlighting the fluidity of emotional perception influenced by contextual factors.

The evolution in participants' emotional expressions over a four-month interval underscores the multifaceted nature of music's impact on individuals, shedding light on the nuanced interplay between tempo, lyrical content, and personal experiences in shaping emotional perception. By unraveling the tapestry of emotional responses to music over time, this research contributes to a nuanced understanding of the complex interplay between music and emotion within the human experience.

By employing diverse methodologies and theoretical frameworks, researchers continue to unravel the intricate relationship between music and emotional experience, with implications for various domains including therapy, performance, and everyday life.

Furthermore, the findings from this study contribute to existing scientific research by providing empirical evidence of the temporal nuances in emotional responses to music. While previous studies have emphasized the role of musical elements and individual differences in shaping emotional experiences, this longitudinal exploration delves deeper into the dynamic evolution of emotional perception over time.

By complementing existing literature with real-time observations, this study enhances our understanding of the complex relationship between music and emotion, offering valuable insights for therapeutic interventions and mood regulation strategies.

#### 5. References

Aburto-Corona, Jorge A., Jose Antonio de Paz, José Moncada-Jiménez, Bryan Montero-Herrera, and L.M. Gómez-Miranda. 2021. "Does the musical tempo enhance physical performance?" *Psychology of Music* 49(4): 890-900. <https://doi.org/10.1177/0305735620904777>

- Balkwill, Laura Lee and William Forde Thompson. 1999. "A cross-cultural investigation of the perception of emotion in music: psychophysical and cultural cues." *Music Percept* 17: 43–64. <https://doi.org/10.2307/40285811>
- Coutinho, Eduardo and Angelo Cangelosi. 2006. "The dynamics of music perception and emotional experience: a connectionist model." In *Proceedings of the 9th International Conference on Music Perception and Cognition (ICMPC9)*, ed. by Mario Baroni, Anna Rita Addessi, and Marco Costa, 1096-1104. Bologna, Italy: Bologna University Press.
- Fernández-Sotos, Alicia, Antonio Fernández-Caballero, and José M. Latorre. 2016. "Influence of Tempo and Rhythmic Unit in Musical Emotion Regulation." *Frontiers in computational neuroscience* 10: 80. <https://doi.org/10.3389/fncom.2016.00080>
- Han, Donghong, Yanru Kong, Jiayi Han, et al. 2022. "A survey of music emotion recognition." *Front. Comput. Sci.* 16: 166335. <https://doi.org/10.1007/s11704-021-0569-4>
- Juslin, P. N., Sloboda J. A. 2001. *Music and Emotion: Theory and Research*. Oxford: Oxford University Press. <https://doi.org/10.1037/1528-3542.1.4.381>
- Kawakami, Ai, Kiyoshi Furukawa, Kentaro Katahira, and Kazuo Okanoya. 2013. "Sad music induces pleasant emotion." *Frontiers in psychology* 4: 311. <https://doi.org/10.3389/fpsyg.2013.00311>
- Peretz, Isabelle, Lisa Gagnon, Bernard Bouchard. 1998. "Music and emotion: perceptual determinants, immediacy, and isolation after brain damage." *Cognition* 68: 111–141. [https://doi.org/10.1016/S0010-0277\(98\)00043-2](https://doi.org/10.1016/S0010-0277(98)00043-2)
- Schaefer, Hans-Eckhardt. 2017. "Music-Evoked Emotions-Current Studies." *Frontiers in neuroscience* 24(11): 600. <https://doi.org/10.3389/fnins.2017.00600>
- Swaminathan, Swathi and E. Glenn Schellenberg. 2015. "Current Emotion Research in Music Psychology." *Emotion Review* 7(2): 189-197. <https://doi.org/10.1177/1754073914558282>
- Thompson, William Forde and Lena Quinto. 2014. "Music and emotion: Psychological considerations." In *The aesthetic mind: Philosophy and psychology*, ed. by Elisabeth Schellekens and Peter Goldie, 357–375. Oxford University Press.
- Zentner, Marcel, Didier Grandjean, and Klaus Scherer. 2008. "Emotions evoked by the sound of music: Characterization, classification, and measurement." *Emotion* 8(4): 494-521. <https://doi.org/10.1037/1528-3542.8.4.494>