The Effects of Music on the Induction of Emotional States Over Time

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Introduction

While there are many theories that hold positions on music and the expression of emotion, the **embodied cognitive** perspective offers a promising framework for better understanding human-music perception. Within the last 15-20 years, the cognitive science field and the Music Embodied Cognition subfield have made great advances in this understanding, however research in this field is relatively new and unexplored. Within my paper, I explore prominent work from these fields and push for an embodied perspective when designing future research studies.

Introduction

Main Claim: Carefully selected positive and negative excerpts can be affective in inducing happy and sad states, and these states are heavily dependent on the Eight Avenues of Musical Affect in Arnie Cox's book, Music Embodied Cognition: Listening, Moving, Feeling, & Thinking.

Cognitivism/Embodied Cognition

Cognitivism

- Human cognition mediated by something **internal** to the organism
- Early research suggests that perception is **flawed**
- Brain becomes the **sole** resource for cognition

Embodied Cognition

- Human cognition mediated by resources both **internal** and **external** to the organism
- Perception is **not flawed**
- **Brain, Body, Environment** become resources for cognition

Four Key Questions

Within Wilson & Golonka's 2013 study, they suggest four questions to adhere to when addressing research within the EC field.

1. **What is the task to be solved?**
    a. Embodied cognitive solutions solve specific tasks rather than general problems, so it is essential to identify the task it is trying to solve at that time
2. **What are the resources that the organism has access to in order to solve the task?**
    a. With embodied cognition comes the implication that there are multiple resources (brain, body, environment, and their interaction) available to an agent.

Four Key Questions Cont.

3. How can these resources be assembled so as to solve the task?

a. Wilson and Golonka explain that because we only have access to information about our bodies and the environment via perception, so there must be a detailed account of the perceptual information used to connect these resources

4. Does the organism, in fact, assemble and use these resources?

a. This last question refers to whether the assembled resources within question 3 are an accurate description of the system the organism has assembled to solve the task.

Music Embodied Cognition

From the perspective of Embodied Cognition, music needs to be separated into some of its **intrinsic** and **extrinsic** properties in order to better understand their roles in their interactions with music perception. While there isn't one particular way to represent music's interaction with humans, Arnie Cox's *eight avenues of musical affect* encompasses the intrinsic and extrinsic properties of music perception from an embodied perspective.

1. **Memetic Participation**
    a. Memetic behavior in general can be seen as humans understanding other entities and events in their environment through **Mimetic Motor Action (MMA)** and **Mimetic Motor Imagery (MMI)**, which put simply by Cox himself, MMA corresponds to “monkey see, monkey do,”, while MMI corresponds to “monkey see, monkey imagine-do”.
2. **Anticipation**
    a. Four general principles from Huron’s work cover important aspects of anticipation
        i. Explicit anticipation of events (favorite musical moments)
        ii. Anticipation is automatic and more or less continuous
        iii. Successful prediction is positively valenced, while failed predictions are negatively valenced
        iv. Repeated exposure to music genres, artists, and individual songs increases one's ability to predict what will happen in the next given context

3. **Expression**

a. Refers to the expression of emotions in other people both objectively (**non-mimetic perception**) and empathetically (via **mimetic comprehension**

4. **Acoustic Impact**

b. The five components of music that affect the way sounds seem to "come at us", according to Cox.
   i. ***Pitch Height***
   ii. ***Sound Duration***
   iii. ***Timbre*** (degree of *focus* when playing a note. Ex. quiet & diffused vs quiet and intense)
   iv. ***Strength*** (amplitude or volume of entire wavelength (attack, sustain, and decay))
   v. ***Location*** (either physical space at a concert or artificially created space by music producers)

5. **Explicit/Implicit Analysis**

   a. Cox states that when analyzing something, humans ask questions like, *what is that?* Or *what will happen next?* Out of need to maintain homeostasis which are tied to feelings of wanting to understand and evaluate feelings related to one's progress in answering those questions. So, in the musical context, humans ask these questions both **implicitly** and **explicitly**, which will affect the musical experience whether or not one engages in explicit music analysis

6. **Associations**

   b. Within the context of music perception, this includes both **cultural associations** (popular songs played at weddings) and **personal associations** (having a personal relationship 'song' with someone).

7. **Exploring Taboos**

    a. The sense of surviving artificially made negative experiences can give individuals a sense of empowerment or pleasure. This musical affect is entirely dependent on what the person finds as taboo, and what qualifies as transgressing that boundary.

8. **Invisibility, Intangibility, and Ephemerality of Musical Sounds**

    b. Cox lists the central element of affect in this section as a fear of something we can't see or touch, which affects us via our ears. Cox states that it's important to distinguish the different contexts which musical features play out:
        i. Live performance by human performers
        ii. Audio-only recordings of human performances
        iii. Live performance with previously recorded sounds
        iv. Recordings of iii.
        v. Works composed for media that mix human and electronically produced sounds
        vi. Media recordings which human exertion is not evident

How do you record emotional states within a study?

While these methods may not encapsulate all of the information needed to indicate a wide variety of emotional states, they give enough data to yield effective and significant results for **happy** and **sad** emotional states.

- Electrodermal Activity (often Skin Conductance Response (SCR))
- Heartrate
- Valence-Arousal Self Report Methods

How Does Music Affect the Induction of Emotional States?

- ‘Happy’ excerpts *tend* to elicit **larger SCR**, **faster heart rates,** and faster respiration rates compared to ‘Sad’ excerpts.
- The ‘happy’ vs ‘sad’ distinction in general is heavily dependent on removing pitch variations, and cannot be made through tempo and rhythm alone.
- While there are many other studies corroborating this evidence, there are some studies obtaining mixed results with **sadness** specifically.
- Recent studies have been encouraging future researchers to look into the ‘multifaceted emotional experience underlying sad music’. (Ribeiro et al., 2019).

How Does Music Affect the Induction of Emotional States?

- Specifically over time, any self-reported adjectives would change back to neutral after 2 minutes in the recovery phase, with higher skin conductance levels reported for at least 4 minutes after the induction.

Why does sadness give mixed responses?

Within my paper I include a few examples of studies that either directly test or give warnings for future studies on **sadness**. These studies include Deep mind wandering (Taruffi, 2017), exploring taboos such as dissonance and enjoyment of sad music (Chaplin, 2019; White & Rickard, 2015; Ribeiro et al., 2019), and framing music with social interaction (Dell 'Anna et al., 2021). Many of the studies listed are **cultural**, **environmental** or **socially** based issues that can be better understood from the embodied perspective.

Conclusion

Overall, I hope that the information within my paper will further inform whoever is reading about the properties of music, how music affects emotional states, and will understand more about the importance of the embodied cognition movement towards current music perception studies.

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