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First Notes – Pass 1

Primary Sources

1. ***Measuring Cardiac and Electrodermal Responses of Emotional States and their Persistence***
   Assuming that music can generate happy and sad emotions, it is possible to argue that valenced music could also generate moods. In this perspective, the mood can be defined as a general affective background that persists over time without a specific stimulus (Beedie et al., 2005). To assess the musical influence on mood, Eich and Metcalfe (1989) produced continuous musical induction throughout a 90-min session, while participants performed an encoding and retrieval task. Mood states were measured throughout different moments in the session. Results showed that, in the beginning, positive (or negative) songs made participants feel happy (or sad) as measured by self-report, and with repeated exposure, the mood manipulation lost some of its intensity. (**p.2**)

2. ***Embodied Cognition is not what you think it is***
   Because perception is assumed to be flawed, it is not considered a central resource for solving tasks. Because we only have access to the environment via perception, the environment also is not considered a central resource. This places the burden entirely on the brain to act as a storehouse for skills and information that can be rapidly accessed, parameterized, and implemented on the basis of the brain's best guess as to what is required, a guess that is made using some optimized combination of sensory input and internally represented knowledge. This job description makes the content of internal cognitive representations the most important determinant of the structure of our behavior. *Cognitive science is, therefore, in the business of identifying this content and how it is accessed and used.* (**p.2**).

3. ***Event-related skin conductance responses to musical emotions in humans***
   Measuring electrodermal activity is one technique that provides readily accessible autonomic indices, such as the skin conductance response (SCR). SCR is due to rapid fluctuations in eccrine sweat gland activity, which result from the liberation of acetylcholin by the sympathetic nervous system [2]. This measure has the advantage over other measures

of the autonomic nervous system such as heart rate, since SCR is under strict control of the sympathetic branch of the nervous system. (**p. 145**)

4. ***Role of tempo entrainment in psychophysiological differentiation of happy and sad music?***
   One way to explore the emotional responses to music is to consider both conscious emotional assessments in recognition task (emotion identification), for example, and automatic psychophysiological responses to stimuli that reflect emotional responses likely related to feeling. (**p. 17**)

5. ***Emotion elicitation during music listening: Subjective self-reports, facial expression, and autonomic reactivity.***
   Listening to music activates brain regions involved in emotion and reward, including the ventral striatum, amygdala, orbitofrontal cortex, anterior cingulate cortex, and the insula (Blood & Zatorre, 2001), as well as other areas typically associated with cognitive processes such as the anterior hippocampus and auditory cortex (Koelsch, 2020). Interestingly, brain activation reveals a segregation of subcortical areas that responds to differences in affective dimensions. For example, chills evoked by pleasant music tend to correlate with an increased activation in nucleus accumbens and insula (Blood & Zatorre, 2001). In addition, high pleasurable moments during music listening are related to dopamine release in the ventral region of the striatum (Salimpoor et al., 2011). In contrast, amygdala seems to be specifically activated during unpleasant chill responses (Klepzig et al., 2020), as well as during the fear and tension evoked by music (Koelsch, 2006; Koelsch & Skouras, 2014). (**beginning of introduction**)

6. ***The Role of Peripheral Feedback in Emotional Experience With Music***
   Evidence for the role of peripheral feedback in emotional experience comes from a variety of sources. Schachter and Singer (1962) theorized that physiological arousal combined with cognitive labeling resulted in an emotion. More specifically, they argued that when individuals have no immediate explanation for their arousal, they will label their emotion in terms of the cognitions available to them; when they have an explanation at hand, they are unlikely to use other information to "label" their feeling state; and they will describe their feelings as emotions according to the extent of their physiological arousal. (**p. 81**)

7. ***Cardiovascular and respiratory responses during musical mood induction***
   It is generally accepted that large and reliable changes in physiological states are associated with emotional responses, regardless of the manner in which the emotional response was induced. There is consensus that such physiological changes are a reliable correlate of

certain psychiatric disorders, including anxiety and panic disorders and depression (Berntson and Cacioppo, 2004; Berntson et al., 1998; Grossman, 1983; Wientjes, 1992). However, whether specific physiological patterns for each unique normal emotional state exist is controversial (e.g. Collet et al., 1997; Hagemann et al., 2003; Levenson and Ekman, 2002). (**p. 58**).

Secondary Sources

1. ***Music and Embodied Cognition: Listening, Moving, Feeling, and Thinking***
   By imitation I mean not only the overt behavior of "monkey see, monkey do" but also covert imitation that occurs only in imagination. These forms of imitation occur whenever we attend to the behavior of others, whether in the performing arts or athletics, or in learning a particular skill from someone else's demonstration, or in merely taking an interest in what others are doing. When we imitate overtly or covertly, in effect we are responding to two implicit questions: What's it like to do that? and its twin question, what's it like to be that? We answer these questions in part by overtly and covertly imitating the behavior of others. (**p.11**).

2. ***Cross-Cultural Comparisons of Affect and Electrodermal Measures While Listening to Music***
   In 1997, Krumhansl [7] measured EDL among other signals from 38 college students with musical backgrounds, while they listened to six classical music excerpts, divided into three groups based on their intended emotion: fear, sadness and happiness. Results showed a decrease in EDL for all emotions, with sadness being the lowest, followed by fear and happiness. Khalfa et al. [8] measured the magnitude of EDRs from 34 participants, with no specified background, who were presented with 28 musical clips lasting seven seconds that were unknown to participants. These were classified in four groups: fear, happiness, sadness, and peacefulness. EDRs showed higher magnitudes for both fear and happiness, and lower magnitudes for sadness and peacefulness. No significant differences in EDR magnitudes were found between happiness and fear or between sadness and peacefulness. (**p.2**).

3. ***Origin of Music and Embodied Cognition***
   At lower levels KI acts automatically: sensory-motor experiences are directly embodied. But at higher levels abstract knowledge is called abstract exactly because it does not exist pre-formed in the world, it is created through the interaction of the world and the mind. But cognitive dissonance (CD), a mechanism opposite to KI, might interfere at higher levels. CD is a discomfort caused by holding conflicting cognitions (Festinger, 1957; Cooper,

2007; Harmon-Jones et al., 2009). This discomfort is usually resolved by devaluing or discarding the conflicting cognition. This discarding often occurs below the level of consciousness; it is fast and momentary (Jarcho et al., 2011). It is also known that the majority of new knowledge originates through the differentiation of previous knowledge, which is the mechanism for several broad empirical laws: Zipf's law, the power law, Pareto law emerge when new entities (or usage) evolve from pre-existing ones (Simonton, 2000; Newman, 2005; Novak, 2010). Therefore, almost all knowledge contradicts other knowledge to some extent. According to CD theory, any knowledge should be discarded before its usefulness becomes established (Perlovsky, 2013a). (**p.2**)

4. ***Musical Interaction reveals music as embodied language***

   This proposal heeds Ian Cross' call for an investigation of music as an "interactive communicative process" rather than "a manifestation of patterns in sound" (Cross, 2014), with an emphasis on its embodied and predictive (coding) aspects (Clark, 2016; Leman, 2016; Koelsch et al., 2019). In the present paper our goal is: (i) to propose a framework of music as embodied language based on a review of the major concepts that define joint musical action, with a particular emphasis on embodied music cognition and predictive processing, along with some relevant neural underpinnings. (**p.1**).

5. ***The Routledge Handbook of Embodied Cognition (pp. 81 – 89)***

   Research on music perception has been guided by a paradigm that focuses on the anticipation of perceived structural components in music (Meyer, 1956; Huron, 2006; Honing, 2011). Anticipation is based on the ability to discern patterns (e.g. melodies, rhythms, timbres) that emerge from music through our senses. These patterns are compared with previously stored knowledge and used to generate expectations about music. The degree of match between the expected and the newly perceived pattern may then generate an outcome that is further processed by the emotional or motor system. (**p.81-82**).