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## First Notes – Pass 3

### Primary Sources

1. ***Measuring Cardiac and Electrodermal Responses of Emotional States and their Persistence***
   The length of each music excerpt was precisely 3 min, and each musical excerpt was edited using Audacity R 2.1.2 to avoid startling participants. "Fade out" and "fade in" were applied when necessary and normalized to the same Root Mean Square loudness level. The musical excerpt used for negative induction was Albinoni "Adagio" composed in G-minor with 3/4 time signature. For positive mood induction, we used Bach "Brandenburg concert n◦ 2" composed in F-Major with 2/2 time signature. The neutral excerpt was "Steve Reich-Variations for winds, strings, and keyboard" composed in C-minor/C-flat, and B-major, with varied time signatures (**p.4**)

2. ***Embodied Cognition is not what you think it is***
   What are the resources that the organism has access to in order to solve the task? Embodied cognition implies that there are resources, plural, available to the organism. These resources include the brain but also the body, the environment, and the relations between these things (e.g., the motion of our bodies through the environment). A task analysis should include an exhaustive list of resources available that might contribute, beginning with those available via perception and action and only hypothesizing more complex cognitive resources once the capabilities of these other resources have been exhausted. An exhaustive list is possible if you are able to characterize your task formally; tasks are differentiated from each other in terms of their underlying dynamics (e.g., Bingham, 1995) and thus it is becoming common practice to formalize the task description using the tools of dynamical systems (e.g., Fajen and Warren, 2003; Bingham, 2004a,b; Schöner and Thelen, 2006). (**p.2**).

3. ***Event-related skin conductance responses to musical emotions in humans***
   Stimuli consisted of 28 musical clips of 7 s duration, for which the emotional content has been previously assessed and validated [14]. These clips were composed in a film music genre for research means, and so were completely novel for the subjects. The clips were equally distributed across four emotions, and equated in terms of arousal and valence. However, due to a strong habituation effect across the entire set of musical clips, SCRs were

analyzed for the first half of excerpts presented. In this smaller set, four excerpts were to evoke a sense of fear ('peur'), another four happiness ('gaiete´'), three others sadness ('tristesse') and three clips peacefulness ('apaisement') (see musical scores in Appendix A). As in the literature, happy excerpts were characterized by a fast tempo and were played in a major mode whereas sad excerpts had a slow tempo and were played in a minor mode [13]. The structural determinants of the peaceful and fearful excerpts are less well established and were empirically verified in our previous study [14]. (**p. 146**)

4. ***Role of tempo entrainment in psychophysiological differentiation of happy and sad music?***
This happy–sad music distinction may be the result of responses to the acoustical parameters responsible for this distinction. Indeed, on one hand, happy music is typically fast (and written in major mode) while sad music is typically slow (and written in minor mode) (Balkwill and Thompson, 1999; Gabrielsson and Juslin, 1996; Peretz et al., 1998). The happy/sad distinction relies on two major musical features: tempo (i.e. the number of beats per minute) (Gabrielsson and Lindstrom, 2001; Schellenberg et al., 2000), and mode (i.e. the specific subset of pitches used to write a given musical excerpt) (Krumhansl, 2001). The specific manipulation of musical tempo affects the perception of happiness and sadness (Dalla Bella et al., 2001; Khalfa et al., 2005). On the other hand, entrainment to tempo or rhythm which is not specific to music has been described. It is a phenomenon in which two or more independent rhythmic processes synchronize with each other (Clayton et al., 2005; Jones and Boltz, 1989). This is why Etzel et al. (2006) pointed out that the significant respiration rate difference between happy and sad excerpts they observed seems to be attributable to entrainment of respiration to tempo (Haas et al., 1986), and/or to rhythm (i.e. temporal patterning conveyed by tones' perception). (**p. 18**)

5. ***Emotion elicitation during music listening: Subjective self-reports, facial expression, and autonomic reactivity.***
A total of 42 musical excerpts (14 unpleasant, 14 pleasant, and 14 neutral) were selected from the Film Music Stimulus Set (FMSS; Eerola & Vuoskoski, 2011) based on the Spanish normative values for two affective dimensions (valence and energy arousal) (Fuentes-Sánchez et al., 2020). Particularly, unpleasant and pleasant excerpts were evaluated below 4 and above 6 in hedonic valence, respectively, whereas all stimuli in both categories were rated above 6 in energy arousal. Music excerpts classified as neutral were rated between 4 and 6 in hedonic valence, and below 4 in energy arousal…Furthermore, with the aim of reducing other confounding variables, all excerpts used in this experiment were also rated as certainly unfamiliar in the previous Spanish validation study (Fuentes-Sánchez et al., 2020). Particularly, the normative values in familiarity (3-point scale: 0 unfamiliar; 1

somewhat familiar; and 2 very familiar) were as follows: M = 0.30, SD = 0.17, 95% CI [0.24–0.35]. (**Stimuli and Design**).

6. ***The Role of Peripheral Feedback in Emotional Experience With Music***
   The research reported in this article investigates the influence of arousal on emotional experience directly for the first time, by focusing on the effect of induced arousal on emotional experience of music and on how this is mediated by the valence and energy (arousal) characteristics of the music. By inducing arousal through exercise, rather than through a film, which has its own valence characteristics, the experiments carried out here aim to investigate the effects of undifferentiated arousal on emotional experience of music. (**p. 84**)

7. ***Cardiovascular and respiratory responses during musical mood induction***
   Music stimuli were selected from a large pool of potential stimuli using a pilot study. The chosen stimuli produced the most intense and specific reported experience of each target emotion: happiness, sadness, and fear (details are presented in Johnsen, 2004). The stimuli consisted of 12 music clips; four different clips were chosen to induce each target mood (fear, sadness, or happiness). Details of each stimulus appear in Table 1. The stimuli were short classical music selections taken from movie soundtracks ranging in length from 74 to 189 s (M = 136 s). Stimuli of various lengths were used so that each clip could form a musically complete unit. The stimuli are labeled by a letter indicating the targeted mood (H = happiness, F = fear, S = sadness) and a number indicating its place in the presentation order (the presentation order was the same for all subjects). The music was selected based on how well it induced each specific mood; no effort was made to match tempo, mode, or pitch. The stimuli were presented via headphones at a loud, but comfortable, volume. (**p. 59**).

## Secondary Sources

1. ***Music and Embodied Cognition: Listening, Moving, Feeling, and Thinking***
   In plain terms, participants were better at comprehending heard actions (the sound of musical performance) that shared an exertion schema with actions that they had performed previously. These findings are also consistent with the proposition that rhythm perception involves real time MMI, or mimetic enactment of the rhythms heard, based on previous overt imitation (MMA). (**p.19**).

2. ***Cross-Cultural Comparisons of Affect and Electrodermal Measures While Listening to Music***

Due to the conflicting results and the non-uniformity of the methods, it is difficult to extract meaningful relationships between physiological responses, music, and affect from these as well as other studies in the literature [18]. Based on this, EiM was designed with two specific goals. First, to address the concern of the generalizability of results when physiological responses are measured in a laboratory environment [19], [20], data is collected outside of a laboratory in a more ecological environment. Second, to address issues that may arise in an environment that is not completely controlled, as well as the many potential differences in physiological responses with respect to age [21], [22], sex [23], [24], race and ethnicity [21], [25], personality [26], [27], and even the time of day [28], [29], among others, a large sample size is imperative. It is also important that the study draw from demographically diverse populations [30]. Finally, it is important to highlight that this approach allows for the exploration of a number of different research questions. (**p.3**).

3. ***Origin of Music and Embodied Cognition***

   How can multiplicity of emotions be explained and justified from a cognitive and evolutionary standpoint, and why has this ability emerged? The proposed hypothesis relating music to CD suggests the following explanation. CD produces a variety of emotional discomforts, different emotions for every combination of knowledge—in other words, a huge number of emotions. Most of these emotions are barely noticed because they lie below the level of consciousness, and in these unconscious states they produce disincentives for knowledge. Music helps to overcome these emotional discomforts by developing a huge number of conscious musical emotions. The mind being conscious of the multiplicity of emotions can bring into consciousness emotions of CD, and thus be prepared to tolerate them. We enjoy even sad and difficult musical emotions for their positive effect of overcoming difficult CD. Possibly this explains the mysterious enjoyment of sad music: it helps us to overcome CD of life's unavoidable disappointments, including the ultimate one, the knowledge of our finiteness in the material world. (**p.3**)

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

   Firstly, consider entrainment, the phenomenon that brings a body rhythm to synchronize to a music rhythm (Clayton, 2012; Phillips-Silver and Keller, 2012; Moens and Leman, 2015). The sensorimotor prediction and adaptation mechanisms are supported by neuronal circuits in the posterior parietal lobe, premotor cortex, cerebro-cerebellum and basal ganglia, giving rise to the phenomenon of "groove" (Janata et al., 2012), suggesting that the same processes that cause bodily motion are involved in musical rhythm perception. (**p.5**).

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

   Moreover, music perception as a cognitive process can be described in terms of an abstract pattern-processing model that is independent from the physical carrier (body, hardware) of the processing. The processing consists of (1) a pattern-learning module that takes structures from music and organizes them into memory, (2) a pattern-prediction module that uses musical input and previously learned structures to predict the next input, (3) a pattern-association model that relates the consequences of the prediction to cognitive, emotive and motor outcomes. Levels (1) and (2) address syntactic processes, while level (3) addresses semantic processes. (**p.83**).