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Preparing Empirical Methodologies to Examine Enactive, Embodied Subjects Experiencing Musical Emotions

Introduction

There is a lot of exciting empirical research currently taking place studying how music listeners experience emotion. Stefan Koelsch thinks that this is no surprise, as

Using music to investigate the neural correlates of emotion has several benefits: (1) Music is capable of evoking *strong emotions* (usually more powerful than, for example, static images of faces). Strongly pleasurable responses to music can involve, e.g., goose bumps or shivers down the spine. (2) Music can be used to investigate *mixed emotions* (such as 'pleasant sadness'). (3) Music can evoke a wide *variety of emotions*.¹

However, with these great developments that are taking place, I feel that there are a few problems that need to be addressed before we can take the necessary steps to move this research to a new level that can recognize an enactive, embodied listener in the world.

Faculty Psychology² has presented a view of the mind that is modular, where individual faculties are assigned different tasks, and each of these faculties arise from localized processes in the brain. This viewpoint has separated the function of the mind on both the macro and micro scales to individually hierarchized regions of the brain. Perceptual integration is thus categorically different and processed separately from emotion, which is processed separately from cognition, which is separate from action tendency.³ This has often been colloquially described as the "cognitive sandwich", with perception and action tendency forming the slices of bread surrounding the cognizing processes. On a smaller scale, individual emotions (such as happiness or anger) would

- 1 Stefan Koelsch, *Brain and Music* (John Wiley & Sons, 2012), 203.
- 2 Faculty Psychology has been a school of psychology that has argued for the brain to be separated into specialised, encapsulated modules that are anchored on an a priori basis to their specialisation. Can be seen in Jerry A. Fodor, *The Modularity of Mind: An Essay on Faculty Psychology* (MIT Press, 1983).
- 3 D. W. Massaro, "An Information-Processing Analysis of Perception and Action," ed. Dr Odmar Neumann and Prof Dr Wolfgang Prinz (Springer Berlin Heidelberg, 1990), 133–66.

also be localized to their own respective places in the brain, and your impressions of your grandmother might even be localized to a specific neuron or bundle of neurons.⁴ As a result, a goal of Faculty Psychology is to disentangle and localize the essences of thought, often reducing them to universal Platonic Forms, and Lockean essences. Regarding music-related emotions, the Platonic Theory of Forms asserts that there should be specific universal and typological biomarkers hidden behind each particular emotional response, and Locke's theory of essences provides the notion that each emotional response is *caused* by dedicated underlying emotional circuits.

The history of psychology has been a continual battle between different factions to determine the level of reductionism most advantageous to understanding patterns of behaviour. Fighting against essentialism, William James stated that: "The trouble with emotions in psychology is that they are regarded too much as... psychic entities, like the old immutable species in natural history."⁵ In this paper, I will try to follow in the footsteps of James and Wundt,⁶ arguing against psychological essentialisms that attempt to oversimplify rich, dynamic, and situated mental responses into direct causal relationships.

Most recent research on music and emotions has used a locationist approach. This is a softened version of a Faculty Psychology viewpoint that is often agnostic towards whether there are linear (Lockean) cause-and-effect relationships between different mental faculties, but argues that separate emotions should be consistently linked to specific individualized regions of the brain (following Platonic forms).⁷ Many individual papers have found significant results for localized emotional responses to music,⁸ but the meta-analyses by Barrett and Wager⁹ and Lindquist and colleagues¹⁰ have been unable to find evidence that supports this approach significantly and consistently across the numerous studies that they investigated.

Furthering the precariousness of music emotion research, the immutability of psychology research in general has been under fire of late because of the Reproducibility Project undertaken by the Open Science Collaboration. In 2015, they attempted to replicate previous psychology experiments, where they found that only "39% of effects

4 Xu Liu et al., "Optogenetic Stimulation of a Hippocampal Engram Activates Fear Memory Recall," *Nature* 484, no. 7394 (April 2012): 381–85, doi:10.1038/nature11028; R. Quian Quiroga et al., "Invariant Visual Representation by Single Neurons in the Human Brain," *Nature* 435, no. 7045 (June 2005): 1102–7, doi:10.1038/nature03687.

5 William James, *The Principles of Psychology (Vol. 1)* (New York: Holt, 1890), 449.

6 Wilhelm Max Wundt and Charles Hubbard Judd, *Outlines of Psychology* (Bristol, UK: Thoemmes Press, 1998).

7 Kristen A. Lindquist et al., "The Brain Basis of Emotion: A Meta-Analytic Review," *Behavioral and Brain Sciences* 35, no. 03 (June 2012): 121–43, doi:10.1017/S0140525X11000446.

8 E.g. Elvira Brattico et al., "It's Sad but I Like It: The Neural Dissociation Between Musical Emotions and Liking in Experts and Laypersons," *Frontiers in Human Neuroscience* 9 (January 2016), doi:10.3389/fnhum.2015.00676; Philip A. Kragel and Kevin S. LaBar, "Multivariate Neural Biomarkers of Emotional States Are Categorically Distinct.," *Social Cognitive and Affective Neuroscience*, March 2015, 1–12, doi:10.1093/scan/nsv032.

9 Lisa Feldman Barrett and Tor D. Wager, "The Structure of Emotion Evidence From Neuroimaging Studies," *Current Directions in Psychological Science* 15, no. 2 (April 2006): 79–83, doi:10.1111/j.0963-7214.2006.00411.x.

10 Lindquist et al., "The Brain Basis of Emotion."

were subjectively rated to have replicated the original results¹¹ and only 68% continued to have significant results after combining the original and replicated results. This is considerably lower than would be expected by chance. While I do not fear that this amounts to an impending crisis of psychology, I do think that this reminds us to be ever more vigilant against assuming that there is more stability in the research than there is,¹² and following this, that we need to do everything we can to make as much of the research as possible to be as immutable as possible.

Embodied Cognition

Although Lettvin and colleagues' influential paper "What the Frog's Eye Tells the Frog's Brain"¹³ came out in 1959, and there was substantial work on embodiment in phenomenology and other areas of philosophical research prior to that, embodied cognition seems to be a young area of research. I think that this results from the research area developing in multiple directions at once and being a constructivist approach, both of which can make it more difficult to pin down the major propositions of this theory. For instance, under the umbrella of embodiment (which is often also labelled 4EA) there are embodied, embedded, enactive, extended and affective theories of cognition, but it can also include grounded cognition, sensorimotor theory and many others. Additionally, since individuals have a responsibility to act in a goal-directed manner under the time-constraint pressures of real life, embodiment as constructivism argues that we actively participate in the perception and meaning making of our environment rather than passively apprehending an accurate reality.¹⁴ This situated constructivism makes it difficult to take an immutable and universal rule-based approach. However, the overall concern of the embodiment thesis "is not to determine how some perceiver-independent world is to be recovered; it is, rather, to determine the common principles or lawful linkages between sensory and motor systems that explain how action can be perceptually guided in a perceiver-dependent world"¹⁵ I will later argue that, even without a rule-based approach to cognizing, we can find stable patterns that can give us a good insight into the dynamic roles of emotions in experience.

Embodiment can be seen as a fight against the modularity of faculty psychology earlier introduced. Glenberg and colleagues have presented a fairly succinct characterization of embodied cognition. They state that

- 11 Alexander A. Aarts et al., "Estimating the Reproducibility of Psychological Science," *Science* 349, no. 6251 (August 2015): 943 aac4716-1, doi:10.1126/science.aac4716.
- 12 Michael Lissack, "Second Order Science: Examining Hidden Presuppositions in the Practice of Science," *Foundations of Science*, January 2016, 1–17, doi:10.1007/s10699-016-9483-x; Lee Jussim et al., "Interpretations and Methods: Towards a More Effectively Self-Correcting Social Psychology," *Journal of Experimental Social Psychology*, n.d., doi:10.1016/j.jesp.2015.10.003.
- 13 J. Y. Lettvin et al., "What the Frog's Eye Tells the Frog's Brain," *Proceedings of the IRE* 47, no. 11 (November 1959): 1940–51, doi:10.1109/JRPROC.1959.287207.
- 14 Margaret Wilson, "Six Views of Embodied Cognition," *Psychonomic Bulletin & Review* 9, no. 4 (December 2002): 625–36, doi:10.3758/BF03196322.
- 15 Francisco J. Varela, Eleanor Rosch, and Evan Thompson, *The Embodied Mind: Cognitive Science and Human Experience* (MIT Press, 1992), 173.

the fundamental tenet of embodied cognition research is that thinking is not something that is divorced from the body; instead, thinking is an activity strongly influenced by the body and the brain interacting with the environment. To say it differently, how we think depends on the sorts of bodies we have. Furthermore, the reason why cognition depends on the body is becoming clear: Cognition exists to guide action. We perceive in order to act (and what we perceive depends on how we intend to act); we have emotions to guide action; and understanding even the most abstract cognitive processes (e.g., the self, language) is benefited by considering how they are grounded in action. This concern for action contrasts with standard cognitive psychology that, for the most part, considers action (and the body) as secondary to cognition.¹⁶

My only contention with their description is that it could be more nuanced regarding the 'sorts of bodies' constraining perceptions and experiences. Related to this, Thelen and Smith proposed a dynamical systems approach for the development of movement patterns in infants, after they found that each of their infant subjects faced unique challenges in response to their individual body dimensions, energy levels, and changing contexts.¹⁷ In overcoming the challenges, these infants also used unique strategies, seen as emergent phenomena arising from decentralized and local interactions, which Thelen later argued would be very difficult to defend as being innate.¹⁸ Following Thelen and Smith, I would argue that the body (not only as a form of constraint) takes part in dynamic interactions with the environment, spontaneously guiding the individual to find movements, perceptions, and thoughts that are natural for them in attempting to achieve meaningful experiences and achieve goals.

While there is still some disagreement on the role of mirror neurons,¹⁹ these neurons give considerable support to the notion of embodied cognition. "Thanks to our mirror neurons, we can consciously experience another human being's movements as meaningful. Perhaps the evolutionary precursor of language was not animal calls but gestural communication."²⁰ This is supported by Acharya and Shukla, who state: "Thanks to the mirror neurons, what counted for the sender of the message also counted for the receiver. No arbitrary symbols were required. The comprehension was inherent in the neural organization of the two individuals."²¹ These statements

16 Arthur M. Glenberg, Jessica K. Witt, and Janet Metcalfe, "From the Revolution to Embodiment 25 Years of Cognitive Psychology," *Perspectives on Psychological Science* 8, no. 5 (September 2013): 573, doi:10.1177/1745691613498098.

17 Esther Thelen and Linda B. Smith, *A Dynamic Systems Approach to the Development of Cognition and Action* (MIT Press, 1996).

18 Esther Thelen, "Motor Development: A New Synthesis," *American Psychologist* 50, no. 2 (1995): 79–95, doi:10.1037/0003-066X.50.2.79.

19 Gregory Hickok, *The Myth of Mirror Neurons: The Real Neuroscience of Communication and Cognition* (W. W. Norton & Company, 2014).

20 Thomas Metzinger, *The Ego Tunnel: The Science of the Mind and the Myth of the Self* (Basic Books, 2009), 172.

21 Sourya Acharya and Samarth Shukla, "Mirror Neurons: Enigma of the Metaphysical Modular Brain," *Journal of Natural Science, Biology, and Medicine* 3, no. 2 (2012): 118–24, doi:10.4103/0976-9668.101878.

support the idea that musical experience does not require reflective consciousness understood through linguistic concepts, but rather that the body might be central to the process of meaning-making. This is further supported by Bowman, who asserts: "When we hear a music performance, we do not just 'think,' nor do we just 'hear': we participate with our whole bodies; we construct and enact it."²² Moreover, Vuust and Kringelbach argue that anticipation and predictive coding can explain much of musical emotion.²³ David Huron has also placed considerable emphasis on the role of anticipation in music and has presented learning as a large part of building anticipation, where "learning is not some disembodied social phenomenon, but an evolved neurological process in which aspects of the environment are invited to influence the microstructure of the brain."²⁴ He also repeats similar assertions to this several times through *Sweet Anticipation* for a number of musical properties, where these musical properties are "not some disembodied property."²⁵

There is further support for embodiment in music listening, as motor dysfunctions can impair the processing of musical features (both in Parkinson's²⁶ and Huntington's disease²⁷). Additionally, types of body movements in time with music can impact the expressiveness²⁸ and rhythmic structures perceived in the music.²⁹

Theories of Emotion Measurement

In "Two Dogmas of Empiricism",³⁰ Quine argues that observations themselves are theory-laden. Research is thus shaped by the theories that inform us which aspects we should most likely focus on and which we should ignore, which questions we should ask our subjects, and what data we think our instruments are collecting. Empirical frameworks can greatly assist in the running of an experiment, but the establishment of well-informed hypotheses and the inference of knowledgeable conclusions from gathered results falls outside of their purview. As a result, one must strongly rely on

- 22 Wayne Bowman, "Cognition and the Body: Perspectives from Music Education," ed. Liora Bresler, *Landscapes: The Arts, Aesthetics, and Education* (Springer Netherlands, 2004), 29–50.
- 23 Peter Vuust and Morten L. Kringelbach, "The Pleasure of Music," in *Pleasures of the Brain*, ed. Kent C. Berridge and Morten L. Kringelbach (Oxford University Press, 2009), 255–69.
- 24 David Brian Huron, *Sweet Anticipation: Music and the Psychology of Expectation* (Cambridge, Mass.: MIT Press, 2006), 63.
- 25 *Ibid.*, 101, 124, 200, 264, 359.
- 26 Jessica A. Grahn and Matthew Brett, "Impairment of Beat-Based Rhythm Discrimination in Parkinson's Disease," *Cortex*, Special Issue on "The Rhythmic Brain", 45, no. 1 (January 2009): 54–61, doi:10.1016/j.cortex.2008.01.005.
- 27 Christian Beste et al., "Music Perception and Movement Deterioration in Huntington's Disease," *PLoS Currents* 3 (September 2011): RRN1252, doi:10.1371/currents.RRN1252.
- 28 Pieter-Jan Maes and Marc Leman, "The Influence of Body Movements on Children's Perception of Music with an Ambiguous Expressive Character," *PLOS ONE* 8, no. 1 (January 2013): e54682, doi:10.1371/journal.pone.0054682.
- 29 Jessica Phillips-Silver and Laurel J. Trainor, "Hearing What the Body Feels: Auditory Encoding of Rhythmic Movement," *Cognition* 105, no. 3 (December 2007): 533–46, doi:10.1016/j.cognition.2006.11.006.
- 30 Willard van Orman Quine, "Two Dogmas of Empiricism," ed. Sandra G. Harding, *Synthese Library* (Springer Netherlands, 1976), 41–64.

the theories that have been gathered in advance to support the appropriate methodologies. Regarding the measuring of emotions, Barrett agrees with this and, quoting Greenwald and Ronis, states that: "Without meaningful theoretical integration, newcomers find it difficult to identify what is known about emotion with any degree of certainty. Scientists are paralyzed in a "disconfirmation dilemma" (Greenwald & Ronis, 1981) that makes accumulating knowledge about emotion almost impossible (except within theory-based silos)."³¹

One of the difficulties for designing well-informed hypotheses on music emotion research is that there are multiple theories for classifying and measuring emotions, all of which colour the focus of the experimentation. Furthermore, these emotion theories "agree on very little other than that emotions, as brief reactions with synchronized components (expressions, action tendencies, bodily reactions, feelings, and appraisals), are triggered by "relevant" and "significant" objects in the world."³²

First, there is the discrete emotion theory, which measures emotions as discrete subsets of universal and innate basic emotions.³³ Expanding on this approach, Zentner and co-authors felt that one of the problems of measuring musical experiences was that measurements for everyday experiences of emotion did not adequately match the emotions felt when listening to music (especially for negative music). As a result, they came up with the Geneva Emotional Musical Scales (GEMS) as an adaptation from discrete emotion theory.³⁴ Discrete emotion theory falls under Faculty Psychology, searching for Platonic universal emotions and Lockean essences.³⁵ Of the three emotion theories, discrete emotion theory presents the most feasible methods for achieving positive results if the theory is supported, as it has clear research methodologies and searches for direct linear cause-and-effect relationships with universal emotions. This theory has done well at having listeners categorize their perceptions of a limited number of basic emotions expressed in music³⁶ but has been less successful regarding evoked musical emotions,³⁷ or for evoked emotions in general.³⁸

31 Lisa Feldman Barrett, "Navigating the Science of Emotion," in *Emotion Measurement*, ed. Herbert L. Meiselman (Woodhead Publishing, 2016), 35, doi:10.1016/B978-0-08-100508-8.00008-4; Anthony G. Greenwald and David L. Ronis, "On the Conceptual Disconfirmation of Theories," *Personality and Social Psychology Bulletin* 7, no. 1 (March 1981): 131–37, doi:10.1177/014616728171020.

32 Barrett, "Navigating the Science of Emotion," 31.

33 Paul Ekman, "An Argument for Basic Emotions," *Cognition and Emotion* 6, no. 3–4 (May 1992): 169–200, doi:10.1080/02699939208411068.

34 Marcel Zentner, Didier Grandjean, and Klaus R. Scherer, "Emotions Evoked by the Sound of Music: Characterization, Classification, and Measurement," *Emotion* 8, no. 4 (2008): 494–521, doi:10.1037/1528-3542.8.4.494.

35 Barrett, "Navigating the Science of Emotion."

36 Isabelle Peretz, William Aubé, and Jorge L. Armony, "Towards a Neurobiology of Musical Emotions," *The Evolution of Emotional Communication: From Sounds in Nonhuman Mammals to Speech and Music in Man*, 2013, 277.

37 Thomas Baumgartner, Michaela Esslen, and Lutz Jäncke, "From Emotion Perception to Emotion Experience: Emotions Evoked by Pictures and Classical Music," *International Journal of Psychophysiology* 60, no. 1 (April 2006): 34–43, doi:10.1016/j.ijpsycho.2005.04.007.

38 Lisa Feldman Barrett, "Solving the Emotion Paradox: Categorization and the Experience of Emotion," *Personality and Social Psychology Review* 10, no. 1 (February 2006): 20–46, doi:10.1207/

Second is the appraisal theory of emotions, in which cognitive activity brings forth subjective appraisals that either cause or constitute emotional responses. This theory can further be divided into two groups: causal appraisal theories and constructive appraisal theories. In causal appraisal theory, emotions are caused by individually dedicated emotion detection mechanisms that recognize the cognitive activity that represents a particular emotion. Constructive appraisal theories are similar to causal appraisal theories, but in constructive appraisal the phenomenological experience of the listener does not necessarily match the underlying mechanisms that form that emotional experience. An example of a constructive appraisal theory for music-related emotions is Stefan Koelsch and colleagues' recent quartet theory of emotions, where emotional experiences are the integration of four affect systems in the brain (located in the brainstem, diencephalon, hippocampus, and orbitofrontal cortex) along with inputs from other emotional effector systems (motor, attentional and memory systems), that are also impacted by interactions in society and language.³⁹

Third, there has often been presented a dimensional theory of emotions that places emotions into a 2-dimensional space for arousal and valence, but can also include other dimensions.⁴⁰ Barrett argues that: "So-called "dimensional" theories of emotion do not actually exist. Most of these theories hypothesize valence and arousal as necessary, but not sufficient, features of emotion. Categorizing theories as "dimensional" betrays a fundamental misunderstanding of how these theories work."⁴¹ Instead of reducing and impoverishing these methods to fit them into a "machine metaphor"-inspired discrete emotion theory where they don't really fit, she would prefer that these dimensional theories be considered descriptive maps of emotional experience, falling under constructive theories of emotion.⁴²

Constructive theories of emotion hypothesize that emotions emerge as a process of meaning-making from the automatic and effortless interaction of sensory stimulation (both from the internal milieu of the body and from the world), memory, and basic affective processes. Also, although emotions are phenomenologically experienced as being separate from cognition, constructivists assert that there is no distinction in brain activity between cognition, emotion and perception, and that they all take part in the dynamic interaction between the mind, body and environment.⁴³ Furthermore, constructivists argue that emotional responses do not appear from out of the blue once triggered (as they do in appraisal theories), but instead are continually operat-

s15327957pspr1001_2; Sean A. Guillory and Krzysztof A. Bujarski, "Exploring Emotions Using Invasive Methods: Review of 60 Years of Human Intracranial Electrophysiology," *Social Cognitive and Affective Neuroscience*, February 2014, nsu002, doi:10.1093/scan/nsu002; Joseph LeDoux, *Anxious: Using the Brain to Understand and Treat Fear and Anxiety* (Penguin, 2015).

39 Stefan Koelsch et al., "The Quartet Theory of Human Emotions: An Integrative and Neurofunctional Model," *Physics of Life Reviews* 13 (June 2015): 1–27, doi:10.1016/j.plrev.2015.03.001.

40 This was first mentioned by Wundt, where emotions had 3 dimensions "pleasurable vs. unpleasurable", "arousing vs. subduing", "straining vs. relaxing". Seen in Wundt and Judd, *Outlines of Psychology*.

41 Barrett, "Navigating the Science of Emotion," 32.

42 Lisa Feldman Barrett and James Albert Russell, *The Psychological Construction of Emotion* (Guilford Publications, 2014).

43 Barrett, "Navigating the Science of Emotion."

ing, preparing for the “remembered present”⁴⁴ through simulation. This act of simulation constructs a population of predictions by comparing the present experience to past experiences, and as a result actively constructs a meaningful experience by filtering sensory stimuli through memories of past experiences.⁴⁵ As a result, constructivists postulate that emotions are constructed rather than triggered.⁴⁶ Music listening is a great example of this. David Huron has shown that stylistic knowledge increases both the confidence of the listener and their ability to anticipate upcoming musical events.⁴⁷ Similarly, Salimpoor and co-authors have shown that the anticipation of a pleasurable musical moment elicits a pleasure response often for 10 to 15 seconds before the event.⁴⁸ Paraprosoadokia⁴⁹ can also demonstrate the importance that anticipatory meaning-making plays in reading comprehension. For instance, the ending of Mitch Hedberg’s statement “I haven’t slept for ten days, because that would be too long”⁵⁰ elicits an ‘Aha!’ moment from the necessary reconfiguration of the sentence’s anticipated meaning. Through observing patients with lesions or deficits in emotion processing as being unable to have these ‘Aha!’ moments, Antonio Damasio asserts that these moments are emotional responses driving cognitive activity, and that emotional responses are essential for rational and adaptive behaviour.⁵¹ More recently, others, such as Luiz Pessoa, have argued that any division into cognitive vs. emotional behaviours is problematic due to the dynamic coalitions of activity required to constitute cognitive-emotional behaviours.⁵²

Additionally, constructive theories of emotion deny that there is a possibility to correlate information across modalities of experience. “One measure cannot stand in for another, so that *optimal* measurement of emotion requires a multimodal approach.”⁵³ This outlook is remarkably similar to Hayles’s viewpoint towards the errors she believes we are making on moving into a posthumanist age.

My strategy is to complicate the leap from embodied reality to abstract information by pointing to moments when the assumptions involved in this move were contested by other researchers in the field and so became especially visible. The point of highlighting such moments is to make clear how much had to be erased to arrive at such abstractions as bodiless information. Abstraction is of

44 Gerald Edelman, “Consciousness: The Remembered Present,” *Annals of the New York Academy of Sciences* 929, no. 1 (April 2001): 111–22, doi:10.1111/j.1749-6632.2001.tb05711.x.

45 Barrett, “Navigating the Science of Emotion.”

46 Barrett and Russell, *The Psychological Construction of Emotion*.

47 Huron, *Sweet Anticipation: Music and the Psychology of Expectation*.

48 Valorie N Salimpoor et al., “Anatomically Distinct Dopamine Release during Anticipation and Experience of Peak Emotion to Music,” *Nature Neuroscience* 14, no. 2 (2011): 257–62.

49 A paraprosoadokia is a figure of speech that ends in a surprising way.

50 Eric Zorn, “Fine Lines: Mitch Hedberg,” *Chicago Tribune*, April 4, 2005.

51 Antonio R Damasio, Hanna Damasio, and Yves Christen, *Neurobiology of Decision-Making, Research and Perspectives in Neurosciences* (Berlin ; New York: Springer, 1996).

52 Luiz Pessoa, “On the Relationship between Emotion and Cognition,” *Nature Reviews Neuroscience* 9, no. 2 (February 2008): 148–58, doi:10.1038/nrn2317; Damasio, Damasio, and Christen, *Neurobiology of Decision-Making*.

53 Barrett, “Navigating the Science of Emotion,” 48, italics in original.

course an essential component in all theorizing, for no theory can account for the infinite multiplicity of our interactions with the real.⁵⁴

Since we have only recently gained the tools to analyse data in a multimodal approach through machine learning pattern classification (which does not need to reduce data to abstract bodiless information), constructive psychology is now a quickly developing field. Continuing on this theme, I would argue, given these new methods of pattern classification, that we should attempt to understand the meaning-making process on multiple levels; not only on the group level, but also how these patterns might be individualized, not only as a study of phenomenological experience, but also as an attempt to better understand nonconscious thought processes.

One example of a psychological construction theory is Barrett and colleagues' Conceptual Act Theory.⁵⁵ In this theory, an emotion is hypothesized to be an abstract category, populated with instances of that emotion tailored to fit the experiences and the situated environment of that individual.⁵⁶ Emotions arise from the dynamic interactions of core systems, where "conceptual knowledge is embodied and enactive, producing novel features during an instance of emotion via inference, such that emotional episodes take on functions that the physical sensations do not have on their own."⁵⁷ Emphasizing concepts and vocabulary, Concept Act Theory hypothesizes that words become the statistical regularity that can hold abstract emotional categories together across various emotional instances.⁵⁸

One difficulty in measuring emotion with any of the above theories is that perceiving emotions and experiencing evoked emotions are very different activities especially during musical experiences. Evoked musical emotions have been considered to be ephemeral and personal, but the perception of basic emotions in music is remarkably invariant across listeners,⁵⁹ and children can already easily distinguish between them by the age of six.⁶⁰ Contrary to this stability in the perception of musical emotions, Kallinen and Ravaja have shown that descriptions of emotional experience can vary greatly, depending on whether the subject was asked to describe their perceived emotion of the music or their felt emotion in response to the music. Gabrielsson⁶¹ and Zentner and Scherer⁶² have also corroborated some of Kallinen and Ravaja's results,

54 N. Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (University of Chicago Press, 2008), 12.

55 L. F. Barrett, C. D. Wilson-Mendenhall, and L. W. Barsalou, "The Conceptual Act Theory: A Road Map," in *The Psychological Construction of Emotion*, ed. L. Feldman Barrett and J. A. Russell (New York: Guilford Press, 2014), 83–110.

56 Ibid.

57 Ibid., 87.

58 Barrett, Wilson-Mendenhall, and Barsalou, "The Conceptual Act Theory."

59 Peretz, Aubé, and Armony, "Towards a Neurobiology of Musical Emotions."

60 Joseph G. Cunningham and Rebecca S. Sterling, "Developmental Change in the Understanding of Affective Meaning in Music," *Motivation and Emotion* 12, no. 4 (December 1988): 399–413, doi:10.1007/BF00992362.

61 Alf Gabrielsson, "Emotion Perceived and Emotion Felt: Same or Different?," *Musicae Scientiae* 5, no. 1 suppl (September 2002): 123–47, doi:10.1177/10298649020050S105.

62 Zentner, Grandjean, and Scherer, "Emotions Evoked by the Sound of Music."

in that negatively perceived music is often felt as being either neutral or positive. Additionally, EEG experiments, measuring hemispheric asymmetries by alpha lateralization, have been found to be a good fit with self-reported affective responses for positively perceived music. On the other hand, these EEG results, while still showing reasonably small standard deviations across listeners, tend to be considerably more positive than the self-reported affective responses for negatively perceived music.⁶³ All of these results give me cause for concern in regards to a reliable relationship between the phenomenological experience and the underlying affective mechanisms for emotional musical experiences. One viewpoint is the possibility for conscious confabulation, where conscious experience might not be fully trusted to give a comprehensive or even accurate appraisal of one's embodied experience in the world.⁶⁴ The other is that nonconscious survival instincts are not necessarily equivalent to feelings of emotion. LeDoux states: "we should not assume that observation of one of the nonconscious consequences (elicitation of body reflexes, motivation of more complex behaviours, or reinforcement of learning) means that a conscious feeling of pain or pleasure has occurred."⁶⁵ I will discuss this more later in the subsection on posthumanism. Added to the possibilities for confabulation, self-report, the means of acquiring knowledge on evoked emotional responses, can often be inaccurate even on objectively measurable phenomena (such as height or weight)⁶⁶ and biased due to the social desirability of that response.⁶⁷ Furthermore, as many researchers have argued that music has strong links to cultural and social identity,⁶⁸ this could cause difficulties in disentangling the reporting of an evoked emotional response from its social desirability.⁶⁹ These are big challenges that need to be addressed to adequately measure emotions in musical experiences.

63 Eckart Altenmüller et al., "Hits to the Left, Flops to the Right: Different Emotions during Listening to Music Are Reflected in Cortical Lateralisation Patterns," *Neuropsychologia* 40, no. 13 (2002): 2242–56, doi:10.1016/S0028-3932(02)00107-0; Louis A Schmidt and Laurel J Trainor, "Frontal Brain Electrical Activity (EEG) Distinguishes Valence and Intensity of Musical Emotions," *Cognition & Emotion* 15, no. 4 (2001): 487–500, doi:10.1080/0269993004200187; Enrique O. Flores-Gutiérrez et al., "Metabolic and Electric Brain Patterns during Pleasant and Unpleasant Emotions Induced by Music Masterpieces," *International Journal of Psychophysiology* 65, no. 1 (July 2007): 69–84, doi:10.1016/j.ijpsycho.2007.03.004; C. D. Tsang et al., "Frontal EEG Responses as a Function of Affective Musical Features," *Annals of the New York Academy of Sciences* 930, no. 1 (June 2001): 439–42, doi:10.1111/j.1749-6632.2001.tb05764.x.

64 Other examples of conscious confabulation can be seen in Christopher Chabris and Daniel Simons, *The Invisible Gorilla: And Other Ways Our Intuitions Deceive Us* (Broadway Books, 2011).

65 LeDoux, *Anxious*, 158.

66 S. Connor Gorber et al., "A Comparison of Direct vs. Self-Report Measures for Assessing Height, Weight and Body Mass Index: A Systematic Review," *Obesity Reviews* 8, no. 4 (July 2007): 307–26, doi:10.1111/j.1467-789X.2007.00347.x.

67 James R. Hebert et al., "Social Desirability Bias in Dietary Self-Report May Compromise the Validity of Dietary Intake Measures," *International Journal of Epidemiology* 24, no. 2 (April 1995): 389–98, doi:10.1093/ije/24.2.389; Van De Mortel and Thea F, "Faking It: Social Desirability Response Bias in Self-Report Research," *Australian Journal of Advanced Nursing, The* 25, no. 4 (August 2008): 40.

68 Andy Bennett, *Popular Music and Youth Culture: Music, Identity and Place* (Palgrave Macmillan, 2000); Martin Stokes, *Ethnicity, Identity, and Music: The Musical Construction of Place*, ed. Martin Stokes (Providence: Berg, 1994).

69 Chabris and Simons, *The Invisible Gorilla*.

Conceptual Act Theory has already asserted, through its emphasis on vocabulary and concepts, that an individual's use of vocabulary and concepts can have a very strong impact on their conscious experience. In support of these claims, language has been found to be very helpful in developing concepts and categories; it facilitates the development of new categorizations,⁷⁰ it can be already used by 10-month old infants to group objects that do not look or sound similar to one another⁷¹ and, when dementia patients lose the concept knowledge to describe their emotions, they can lose the ability to perceive them.⁷² Further supporting this, Richard Hilbert found that chronic pain that does not fit within the standard descriptions of pain causes further suffering and social isolation in patients as they have no language with which to describe their pain.⁷³ On top of this, meta-analysis results from Nilsson and López are consistent with the theory that children with language impairment have a "substantially lower ToM [theory of mind] performance compared to age-matched typically developing children."⁷⁴ Furthermore, there have been significant links made between language processing and spatial representation,⁷⁵ language processing and the perception of moving objects,⁷⁶ as well as language processing and colour perception.⁷⁷ Evidence is considerable and growing that language is not an innocent tool, but rather that it has a large impact on conscious experience.

In response to language possibly having repercussions on the description of musical emotions, Zentner and Scherer wrote an exhaustive paper that attempts to minimize the influence of vocabulary and concepts on musical emotion classification. They state that their reasoning for writing this paper was that: "The aforementioned research tradition made valuable contributions to an understanding of music-specific affects—for example, by pointing to the possibility that canonical emotion labels may not do justice to the emotions evoked by music."⁷⁸ From this work,

- 70 Gary Lupyan, David H. Rakison, and James L. McClelland, "Language Is Not Just for Talking Redundant Labels Facilitate Learning of Novel Categories," *Psychological Science* 18, no. 12 (December 2007): 1077–83, doi:10.1111/j.1467-9280.2007.02028.x.
- 71 Kathryn Dewar and Fei Xu, "Do Early Nouns Refer to Kinds or Distinct Shapes? Evidence From 10-Month-Old Infants," *Psychological Science* 20, no. 2 (February 2009): 252–57, doi:10.1111/j.1467-9280.2009.02278.x.
- 72 Kristen A. Lindquist et al., "Emotion Perception, but Not Affect Perception, Is Impaired with Semantic Memory Loss," *Emotion* 14, no. 2 (2014): 375–87, doi:10.1037/a0035293.
- 73 Richard A. Hilbert, "The Acultural Dimensions of Chronic Pain: Flawed Reality Construction and the Problem of Meaning," *Social Problems* 31, no. 4 (1984): 365–78, doi:10.2307/800384.
- 74 Kristine Kahr Nilsson and Kristine Jensen de López, "Theory of Mind in Children With Specific Language Impairment: A Systematic Review and Meta-Analysis," *Child Development* 87, no. 1 (January 2016): 143, doi:10.1111/cdev.12462.
- 75 Daniel C Richardson et al., "Spatial Representations Activated during Real-Time Comprehension of Verbs," *Cognitive Science* 27, no. 5 (September 2003): 767–80, doi:10.1016/S0364-0213(03)00064-8.
- 76 Lotte Meteyard, Bahador Bahrami, and Gabriella Vigliocco, "Motion Detection and Motion Verbs Language Affects Low-Level Visual Perception," *Psychological Science* 18, no. 11 (November 2007): 1007–13, doi:10.1111/j.1467-9280.2007.02016.x.
- 77 Guillaume Thierry et al., "Unconscious Effects of Language-Specific Terminology on Preattentive Color Perception," *Proceedings of the National Academy of Sciences* 106, no. 11 (March 2009): 4567–70, doi:10.1073/pnas.0811155106.
- 78 Marcel Zentner, Didier Grandjean, and Klaus R. Scherer, "Emotions Evoked by the Sound of Music: Characterization, Classification, and Measurement," *Emotion* 8, no. 4 (2008): 496, doi:10.1037/1528-3542.8.4.494.

they developed the GEMS to better describe musical emotions. One of the things of note that they found was that “guilt, shame, jealousy, disgust, contempt, embarrassment, anger, and fear—these and other negative emotions—were reported to be regularly experienced in everyday life but to be practically never aroused by music.”⁷⁹ Their theory that music-evoked emotions are somehow unique (and yet still related) to other types of emotional experiences has been given a little support by Brattico and colleagues (the lateralization of amygdala activations for their research on music-evoked emotions were inversely related to Fusar-Poli and colleagues’ research on visual research),⁸⁰ hints of support by Koelch and colleagues,⁸¹ and have a shared viewpoint with Barrett and colleagues, who consider emotions to vary their optimization for different contexts.⁸² Since the GEMS has been specifically designed for measuring music-related emotions, one might consider this to be the best option for overcoming the impact of language on describing musical experience, except that it has underperformed other models in a few comparative experiments.⁸³ The weaknesses of the GEMS, similar to other discrete emotion theories, is that it has difficulty in measuring ambiguous musical examples, and has difficulty in compatibly classifying emotions across personality types. These results, especially regarding emotion categorization due to personality type, further support the theory that language might have an impact on experience itself and not just on the description of experience.

Since we have not sufficiently resolved descriptions of emotions, the differences between perceived and evoked emotions have not found clear support for universal discrete emotions and psychology is generally having problems of replication, I thus argue that we should follow the ideas of Thomas Kuhn and I advocate for us to openly question the paradigms involved in the study of musically evoked emotions.⁸⁴ Consequently, I advocate bringing in ideas from Actor Network theory to examine the network of relations involved in this research area, as it is suited to doing research within a paradigm shift. I will also borrow from other humanities research areas such as work on Enactivism as developed Ezequiel Di Paolo and

79 Ibid, 500.

80 Brattico et al., “It’s Sad but I Like It”; P. Fusar-Poli et al., “Laterality Effect on Emotional Faces Processing: ALE Meta-Analysis of Evidence,” *Neuroscience Letters* 452, no. 3 (March 2009): 262–67, doi:10.1016/j.neulet.2009.01.065.

81 Koelsch et al., “The Quartet Theory of Human Emotions.”

82 Barrett, Wilson-Mendenhall, and Barsalou, “The Conceptual Act Theory.”

83 Tuomas Eerola and Jonna K. Vuoskoski, “A Comparison of the Discrete and Dimensional Models of Emotion in Music,” *Psychology of Music*, August 2010, doi:10.1177/0305735610362821; Jonna K. Vuoskoski and Tuomas Eerola, “Measuring Music-Induced Emotion A Comparison of Emotion Models, Personality Biases, and Intensity of Experiences,” *Musicae Scientiae* 15, no. 2 (July 2011): 159–73, doi:10.1177/1029864911403367; Mathieu Barthelet, György Fazekas, and Mark Sandler, “Multidisciplinary Perspectives on Music Emotion Recognition: Implications for Content and Context-Based Models,” in *Proc. CMMR*, 2012, 492–507; Julien Dubois and Ralph Adolphs, “Neuropsychology: How Many Emotions Are There?,” *Current Biology* 25, no. 15 (August 2015): R669–72, doi:10.1016/j.cub.2015.06.037.

84 Thomas S. Kuhn, *The Structure of Scientific Revolutions: 50th Anniversary Edition* (University of Chicago Press, 2012).

Hannah de Jaegher,⁸⁵ Music Sociology work of Tia DeNora,⁸⁶ and Posthumanism by N. Katherine Hayles.⁸⁷

Integration of Humanities Research

One might question the introduction of humanities research in this paper. My goal of this paper is not to expound a fully formed research methodology, as the breadth of the materials are not conducive for that, but, instead, to open up a discussion for the integration of research methodologies that might help advance the topic of music emotion research. Following from this, I very much look forward to receiving constructive feedback from across academic disciplines with this goal in mind.

At this point, I think that it might be necessary to briefly address one major con-fabulation of conscious experience, “agnosticism towards another” (a softened version of solipsism), which has often been levelled against empirical methodologies, as empiricism would be a pointless undertaking in a world where individuals are separate islands where generalizations cannot occur. Derrida stated that no

...animal or human individual inhabit[s] the same world as another, however close and similar these living individuals may be... between my world and any other world there is first the space and the time of an infinite difference, an interruption that is incommensurable with all attempts to make a passage, a bridge, an isthmus, all attempts at communication, translation, trope, and transfer that the desire for a world or the want of a world, the being wanting a world will try to pose, impose, propose, stabilize. There is no world there are only islands.⁸⁸

Taken out of context, this quote becomes strongly agnostic towards the existence of others. My intention is not to criticize Derrida, but rather to present a quote that has often been used to advocate for agnosticism toward others in post-structuralist methodologies. This agnosticism is also something that classical empirical methodologies employing Cartesian mind-body separation have had a hard time defending against, which has led to the need to search for essentialisms, universally innate common abilities that allow communication between infinitely separated islands. I counter Derrida’s argument with the more recent embodied perspective of *Being Singular Plural* by Jean-Luc Nancy, which I feel is much more pertinent regarding questions of conscious experience.

That which exists, whatever this might be, coexists because it exists. The co-implication of existing [l’exister] is the sharing of the world. A world is not something external to existence; it is not an extrinsic addition to other existences; the world is the coexistence that puts these existences together... Kant established that there ex-

85 Ezequiel Di Paolo and Hanne De Jaegher, *Towards an Embodied Science of Intersubjectivity: Widening the Scope of Social Understanding Research* (Frontiers Media SA, 2015).

86 Tia DeNora, *Making Sense of Reality: Culture and Perception in Everyday Life* (SAGE, 2014).

87 Hayles, *How We Became Posthuman*.

88 Jacques Derrida and Geoffrey Bennington, *The Beast and the Sovereign (Volume II)*, The Univer (Chicago and London: University of Chicago Press, 2011), 8-9, par. 31.

ists something, exactly because I can think of a possible existence: but the possible comes second in relation to the real, because there already exists something real.⁸⁹

There has been considerable evidence gathered by examining the mental stress, increases of hallucination, and psychiatric morbidity from solitary confinement of prisoners,⁹⁰ as well as developmental delays seen in neglected children in Romanian orphanages,⁹¹ which suggests regular social interactions in the world are important for having a firm grip on reality.

Similarly, the possibility for communication exists due to the real existing prior to us confabulating a reified sense of self. In regards to emotional communication, basic facial emotional expressions have long been considered to be universal,⁹² but recent research suggests that different individuals enact these emotions in different ways, using slightly different combinations of muscles to create smiles and frowns.⁹³ Additionally, Neal and Chartrand have reported that when people are asked to recognize the facial expressions of others, this act triggers a mirrored muscular response on their own face. Furthermore, the subjects in this experiment who had previously undergone botox injections had a reduced ability to move their own facial muscles and similarly had a decreased ability to correctly categorize facial emotional expressions of others.⁹⁴

A compelling argument for embodied cognition is that while Cartesian thinking can often struggle to escape solipsism, embodied cognition already starts with individuals in the world.

At this point, I will discuss the psychological research of emotions in terms of enactivism, music sociology, posthumanism, and actor-network theory.

Enactivism

Enactivism, with its five supporting concepts of autonomy (autopoiesis), sense-making, embodiment, emergence, and experience,⁹⁵ has direct links to constructivist psychology and constructive theories of emotion. Enactivism presents a hypothesis of par-

89 Jean-Luc Nancy, Robert D. Richardson, and Anne E. O'Byrne, *Being Singular Plural* (Stanford: Stanford University Press, 2000), 29.

90 Dorte Maria Sestoft et al., "Impact of Solitary Confinement on Hospitalization Among Danish Prisoners in Custody," *International Journal of Law and Psychiatry* 21, no. 1 (1998): 99–108, doi:10.1016/S0160-2527(97)00025-3; Stuart Grassian and Nancy Friedman, "Effects of Sensory Deprivation in Psychiatric Seclusion and Solitary Confinement," *International Journal of Law and Psychiatry* 8, no. 1 (January 1986): 49–65, doi:10.1016/0160-2527(86)90083-X.

91 Sara J. Morison, Elinor W. Ames, and Kim Chisholm, "The Development of Children Adopted From Romanian Orphanages," *Merrill-Palmer Quarterly* 41, no. 4 (1995): 411–30.

92 Charles Darwin, *The Expression of the Emotions in Man and Animals* (London: John Murray, 1872).

93 Y. I. Tian, T. Kanade, and J. F. Cohn, "Recognizing Action Units for Facial Expression Analysis," *IEEE Transactions on Pattern Analysis and Machine Intelligence* 23, no. 2 (February 2001): 97–115, doi:10.1109/34.908962.

94 David T. Neal and Tanya L. Chartrand, "Embodied Emotion Perception Amplifying and Dampening Facial Feedback Modulates Emotion Perception Accuracy," *Social Psychological and Personality Science* 2, no. 6 (November 2011): 673–78, doi:10.1177/1948550611406138.

95 Hanne De Jaegher and Ezequiel Di Paolo, "Participatory Sense-Making," *Phenomenology and the Cognitive Sciences* 6, no. 4 (October 2007): 485–507, doi:10.1007/s11097-007-9076-9.

ticipatory sense-making, in which the autonomous individual takes an active role in enacting the world, sustaining its identity under precarious conditions (where loss of operational closure leads to death), and whereby coupling between the emergent processes of its existence and environment lead to adaptation.⁹⁶ Enactivism is very much at odds with many of the historical philosophical positions, including Plato's allegory of the cave,⁹⁷ in which an individual is only able to see shadows on the wall and not the true forms due to the limits of the senses, or Locke's passive perception, through which one passively receives ideas.⁹⁸ Instead, enactivism embraces the role of the body as part of the autonomous subject in constant material flux, and the active role it takes in constructing meaning in the world. "Individual acts during [an] interaction are subject to a double normative framework: they are, on the one hand, part of individual sense-making, and, on the other, they are moves in the unfolding of the interactive encounter."⁹⁹ This double normative framework aligns well with Nancy's idea of being singular plural, showing sense-making as necessarily occurring on multiple levels.

Music Sociology

Much of the literature in music sociology on musical emotions has been speculative rather than empirical, as there has not been a long history of recognizing emotions in music. This has been due either to scholars not believing that music has a potential to elicit emotional responses in listeners, or the belief that emotional listening was an abdication of reason.¹⁰⁰ Connected with this, there have historically existed ethically correct modes of attending to music to allow proper appreciation. DeNora has stated that:

listening is too often de-historicised in a way that imposes the model of the (historically specific) silent and respectful listener as a given. Within this assumption, the body of the listener is excised. And yet, such listening involves a high degree of bodily discipline (e.g., stillness, the suppression of coughing, talk, laughter).¹⁰¹

These prescribed ethics of listening seem to be attempting to impose a universal perspective, erasing the body and minimizing the history and location from the listening experience, possibly as an argument in support of a universalized appeal of a select canon of composers that should be revered everywhere and always. Music sociology warns against erasing the variability of human emotional experience in an attempt to find universal emotional experiences.

96 Ibid.

97 Plato, G M A Grube, and C D C Reeve, *Republic* (Indianapolis: Hackett Pub. Co., 1992).

98 John Locke, *An Essay Concerning Human Understanding*, First Amer. vol. II (Boston: David Carlisle, 1803).

99 Ezequiel Di Paolo, "Participatory Object Perception," *Journal of Consciousness Studies* in press (2016): 19.

100 Tia DeNora, *After Adorno: Rethinking Music Sociology* (Cambridge University Press, 2003).

101 Ibid, 84.

Posthumanism

Posthumanism often argues for decentering research away from favouring conscious anthropocentric experience that encourages the idea that the human race is unique and exceptional. This does not attempt to equate music listening practices in humans to those in other species, nor to equate human emotional experiences with those in other species. Instead, posthumanism endeavours to situate the human in its environment, sharing vulnerabilities, co-evolving with other species, and being constituted by and constitutive of other organisms and machines.¹⁰²

As we move deeper into a highly technological regime and as the technological infrastructure surrounding us becomes more and more complex, it becomes increasingly obvious that human agency cannot ever be seen in isolation from the systems with which humans are in constant and constitutive interaction. In fact, the idea that human agency is paramount appears to be an illusion; as Bruno Latour and others have pointed out, it is a good corrective to see agency as distributed among both human and non-human entities.¹⁰³

Similarly, posthumanism considers the notion that consciousness is the driving force of experience to be an illusion. Hayles argues that nonconscious decision-making processes may be superior to cognitive thought processes due to the serial cognitive constraints in cognitive processing as well as other cognitive constraints that arise as a result of attempting to deliver coherent conscious experiences.¹⁰⁴ Since we are interested in how individuals construct their experiences, and if conscious experience is only part of this picture, then should we adjust research methodologies to reflect this?

The difficulty with this problem is that nonconscious processes are not feeling states.¹⁰⁵ As a result, to get the whole picture, we must address both the nonconscious and conscious aspects of emotional experience. This is supported by research suggesting that treatments for anxiety disorders, PTSD, or addiction are greatly enhanced by addressing both the conscious and nonconscious aspects.¹⁰⁶

There is a further difficulty for artistic experience. Some thinkers, such as Dennett¹⁰⁷ and LeDoux¹⁰⁸ place a high value on one's ability to give a verbal report of an experi-

102 Pramod K. Nayar, *Posthumanism* (Cambridge: John Wiley & Sons, 2014).

103 Holger Pötzsch and N. Katherine Hayles, "FCJ-172 Posthumanism, Technogenesis, and Digital Technologies: A Conversation with N. Katherine Hayles," *The Fibreculture Journal*, no. 23 2014: General Issue (2014).

104 N. Katherine Hayles, "Cognition Everywhere: The Rise of the Cognitive Nonconscious and the Costs of Consciousness," *New Literary History* 45, no. 2 (2014): 199–220, 299; This is also supported in Christoph Engel and Wolf Singer, *Better Than Conscious?: Decision Making, the Human Mind, and Implications for Institutions* (MIT Press, 2008).

105 "although innate circuits that are relevant to feelings of fear and anxiety do exist, they are not feeling circuits (circuits that encode conscious feeling of fear or anxiety) but rather survival circuits (circuits that control behaviors that help organisms survive and thrive in the face of challenges and opportunities in life)." LeDoux, *Anxious*, 162.

106 LeDoux, *Anxious*.

107 Daniel C. Dennett, "Real Patterns," *The Journal of Philosophy* 88, no. 1 (1991): 27–51, doi:10.2307/2027085.

108 LeDoux, *Anxious*.

ence for it to be considered a valid conscious experience. As artistic experience both elicits and eludes conceptualization according to Heidegger, I propose that only focusing on the reflective verbally reportable aspect of consciousness impoverishes our understanding of artistic emotions.¹⁰⁹ Following this, Thompson and colleagues state that “phenomenologists emphasize that most of experience is lived through unreflectively and inattentively, with only a small portion being thematically or attentively given.”¹¹⁰ This is well supported by the work of Al Bregman, who spent much of his career studying auditory scene analysis. Bregman researched how sound perceptually either grouped together or split apart into auditory streams, and found that the most transformative effect on how the stream was processed was whether it was foregrounded or backgrounded in the listener’s mind.¹¹¹ With that said, Bregman’s research also supports the notion that both the foreground and background musical elements are consciously experienced by a listener. Koelsch and colleagues suggest that the reflection that gives rise to the possibility for verbal report follows after the (pre-reflective) emotional percept is experienced.¹¹² As a result, they also advocate for a separation between emotional feelings (the part of the experience that reaches reflective consciousness), emotional percepts (pre-reflective consciousness), and nonconscious emotional processes. Furthermore, they state that music “can evoke sensations (e.g., due to emotional contagion) which, *before* they are reconfigured into words, bear greater inter-individual correspondence than the words that an individual uses to describe these sensations.”¹¹³ Studying emotional percepts as well as emotional feelings in response to music might thus give more generalizable results.

Kragel and LaBar have presented a good example of using supervised multivariate pattern classification to find patterns in nonconscious processing that are constitutive of emotional feelings reported in music.¹¹⁴ I think it will be valuable to continue to work in this way to study the different patterns found in response to different emotional contexts (e.g. nonconscious processes that are constitutive of emotions in response to film versus those in response to music). Furthermore, although this will need to be a slow rigorous hermeneutical investigation that slowly builds up knowledge, I also feel it will be valuable to introduce unsupervised learning methods for finding patterns in nonconscious processes constitutive of emotional experiences. These methods will have less predictive power as they will take more time to reduce the number of uninformative inputs present in the algorithm. However, I feel that this methodology can also reduce some of the domination of the verbal report over other aspects of the emotional experience by removing the verbal report as the source of the

109 K Harries, *Art Matters: A Critical Commentary on Heidegger's "The Origin of the Work of Art,"* 2009 ed. (Springer, 2011).

110 Evan Thompson, Antoine Lutz, and Diego Cosmelli, “Neurophenomenology: An Introduction for Neurophilosophers,” ed. Andrew Brook and Kathleen Akins (Cambridge University Press, 2005), 59.

111 Albert S Bregman, *Auditory Scene Analysis : The Perceptual Organization of Sound* (Cambridge, Mass. ; London: MIT Press, 1990).

112 Koelsch et al., “The Quartet Theory of Human Emotions.”

113 Ibid., 20.

114 Kragel and LaBar, “Multivariate Neural Biomarkers of Emotional States Are Categorically Distinct.”

supervision. This type of methodology transitions well to A.N.T., for Latour has stated that “the acronym A.N.T. was perfectly fit for a blind, myopic, workaholic, trail-sniffing, and collective traveller.”¹¹⁵

Actor Network Theory

For many, the work of Latour pursues a narrow bridge connecting humanities research with a pragmatic model of scientific enquiry. Similarly, my goal in this paper has been to present a narrow walkway that aims between the chasms of solipsism on one side and naïve realism on the other. For the most part, I find that the pragmatic empirical methodologies as designed by Charles Sanders Peirce already match well with Bruno Latour’s Actor Network Theory (ANT). Peirce stated, in what has become the pragmatic maxim, “Consider what effects, that might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object.”¹¹⁶ We can achieve clarity in our inquiries and investigations when we can identify the practical consequences of our concepts and methodologies.

In *We Have Never Been Modern*,¹¹⁷ Latour proposes that many of the ideas developed during the Enlightenment are not conducive towards the development of new theories and research methodologies. However, these Enlightenment principles have embedded themselves and become buried into “common sense”¹¹⁸ notions of experience that need to be identified and removed before we can develop new methods of research. For me, this is a central reason for using ANT, bringing to light these hidden strategies that are no longer useful, and also helping us to not overestimate the capabilities of the machines we use to collect data. Machines can become extensions of ourselves, and therefore we can miss the biases that they also bring when they collect data.¹¹⁹ When we follow ANT, we can pay attention to their actions, and see the mediations that they cause.

The quality of science reference . . . depends . . . on the extent of its transformations, the safety of its connections, the progressive accumulation of its mediations, the numbers of interlocutors it engages, its ability to make nonhumans accessible to words, its capacity to interest and convince others, and its routine institutionalization of these flows. . . There do not exist true statements that correspond to a state of affairs and false statements that do not, but only continuous or interrupted reference.¹²⁰

115 Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (OUP Oxford, 2007), 9.

116 Charles Sanders Peirce, “How to Make Our Ideas Clear,” 1878, 293.

117 Bruno Latour, *We Have Never Been Modern* (Harvard University Press, 2012).

118 Similarly, Einstein stated that “common sense is actually nothing more than a deposit of prejudices laid down in the mind prior to the age of eighteen.” Lincoln Barnett, *The Universe and Dr. Einstein*. (New York: Mentor Books, 1948), 58.

119 Eran Shiffman, “More Than Meets the fMRI: The Unethical Apotheosis of Neuroimages,” *Details Journal of Cognition and Neuroethics* (ISSN: 2166-5087). September, 2015 3, no. 2 (2015): 57–116.

120 Bruno Latour, *Pandora’s Hope: Essays on the Reality of Science Studies* (Harvard University Press, 1999), 97.

Conclusion

By taking a constructivist viewpoint, I can understand that each of my individual modes of perception are biased in some way or another. Following animal ethology, to improve my chances of being able to trust that my perceptions are correct, I can build patterns of responses to stimuli that contain unique information from each of the senses.¹²¹ These responses are not correlated against one another to become single data points in time, but rather are kept as patterns of embodied data. Over time, through processes of induction, my mind can develop strategies for using these patterns to be used against new sensory data from new situations to make abstractions of appropriate responses. Similarly, in social situations, I can adjust my abstractions by comparing them against those of individuals that I trust. In research situations, similar strategies can apply. I can bring in data from multiple sources, such as heart-rate variability,¹²² breathing-rate variability and skin conductance,¹²³ eye-tracking and pupil size,¹²⁴ EEG,¹²⁵ fMRI,¹²⁶ and subject response.¹²⁷ These cannot be directly correlated against one another, but abstractions can be made that can allow for multiple interpretations of the data; similarities and differences of individual strategies for encountering a range of stimuli, group abstractions for comparing the strategies for how one might change their strategy for encountering different types of stimuli, and so forth. In the end, this is a pragmatic methodology. It does not worry about whether the abstractions are essential truths, but rather whether they are functional as patterns that have some level of generalizability. Although I do not think that subjective responses need to be a central data point that all other means of collecting data encircle, I think that, even though these subjective responses might have aspects of confabulation, and they do not have access to the mechanisms underlying their phenomenological experience, other measures can not stand in for them. When we treat our data as embodied patterns, not reducing them to abstract information, not reducing variability for the sake of universal Platonic forms, and investigating on multiple levels the possibilities of meaning-making, then and only then can we begin to address questions of embodied emotional experiences in music.

121 David Huron, "Affect Induction through Musical Sounds: An Ethological Perspective," *Philosophical Transactions of the Royal Society of London B: Biological Sciences* 370, no. 1664 (March 2015): 20140098, doi:10.1098/rstb.2014.0098.

122 Julian F. Thayer et al., "A Meta-Analysis of Heart Rate Variability and Neuroimaging Studies: Implications for Heart Rate Variability as a Marker of Stress and Health," *Neuroscience & Biobehavioral Reviews* 36, no. 2 (February 2012): 747–56, doi:10.1016/j.neubiorev.2011.11.009.

123 Valorie N Salimpoor et al., "The Rewarding Aspects of Music Listening Are Related to Degree of Emotional Arousal," *PLoS ONE* 4, no. 10 (2009): e7487–e7487.

124 Bruno Gingras et al., "The Eye Is Listening: Music-Induced Arousal and Individual Differences Predict Pupillary Responses," *Frontiers in Human Neuroscience* 9 (November 2015), doi:10.3389/fnhum.2015.00619.

125 Eckart Altenmüller et al., "Play It Again, Sam: Brain Correlates of Emotional Music Recognition," *Frontiers in Psychology* 5 (February 2014), doi:10.3389/fpsyg.2014.00114.

126 Kragel and LaBar, "Multivariate Neural Biomarkers of Emotional States Are Categorically Distinct."

127 Barrett, "Navigating the Science of Emotion."