MPATC-GE 2042: Psychology of Music

Development
Empirical Research
Topic choice

- Due tomorrow, September 29, before midnight
- Each student must come up with one or more project ideas. The group must then vote on the final topic. If there is a tie, the instructor will cast the tie-breaking vote. Groups should discuss the topic ideas before voting. All of the preliminary topics ideas as well as the final topic must be submitted in a document. The student responsible for each preliminary topic idea and the number of votes that the idea received must also be listed in the submission.

Example:

Group number: 1
Group leader: Ann Walker
Group members: Joe Brown, Mike Smith, Jen Miller
Final topic idea: Pitch memory in melodies
Preliminary topic ideas:
Perception of musical tension in jazz (Ann Walker) - 1 vote
Judging dissonance in harmonic progressions (Joe Brown) - 0 votes
Pitch memory in melodies (Mike Smith) - 2 votes
Syncopation and perception of emotion (Jen Miller) - 1 vote
Empirical research: Six big ideas

1. We never prove anything

• Only logicians and mathematicians can talk about “proof.” Any set of observations can be interpreted in more than one way.

• Conclusions should be expressed as follows:
  – The results are consistent with the view that …
  – The observations indicate that the theory …

• Avoid words like “establish,” “confirm,” or “prove.” Use words like “suggest” or “imply.”
  – Our study suggests that …
  – The results from our experiment imply that …

• Just because we can’t prove anything doesn’t mean we aren’t interested in truth. In fact, the pursuit of truth is one of the main motivations for people who engage in research.

• Our slogan reminds us of the motivation, and simultaneously tells us that the truth is not accessible to us:

• **Slogan:** Motivated by truth, with no hope of proof.
Empirical research: Six big ideas

2. Research invites failure

• Suppose you were trying to convince someone that your idea is right. Which of the following strategies provides a more compelling argument?
  – Identify lots of existing evidence that fits with your theory.
  – Identify lots of the ways in which your theory might be wrong—and show that your theory survives all of these challenges.

• Any set of observations is consistent with innumerable theories. So showing that the evidence is consistent with your theory doesn’t make the most compelling argument.

• In formal empiricism, researchers follow the second rhetorical strategy: Instead of trying to “prove” your theory, try to make your theory fail. Your audience will be more impressed.

• It’s not research if you don’t allow failure. Good research seeks opportunities to refute your own ideas.

• Good research does not involve collecting evidence that supports an idea. Instead, good research involves collecting evidence that tests an idea.

• Research is often motivated by our intuitions, hopes, and (sometimes) secret beliefs. Without these motivations, we wouldn’t have the energy to do all the work involved in research.

• Even if you have no ulterior motive, other researchers may think that you have an ulterior motive. You will convince your most skeptical critic by persistently testing your own ideas.

• **Slogan**: It’s not research if you don’t invite failure.
Empirical research: Six big ideas

3. Make a prediction

• What is a test? If a theory is good, then you should be able to make a prediction about the future.

• An empirical test is a prediction. You predict what as-yet unobserved data should look like.
  – Biblical Adage: You can recognize a false prophet by his/her false prophecies.
  – Empirical Test: You can recognize a false theory by its false predictions.

• Slogan: We invite failure by making predictions.
  (We invite failure by testing hypotheses)
Empirical research: Six big ideas

4. Refutation is easier than confirmation

- The statement “All swans are white” can never be confirmed because you could never be sure that you have observed all swans (David Hume, 18th century).
- However, the statement “All swans are white” can fail by observing a single nonwhite swan. Refutation is easier than confirmation (Karl Popper, 1934).
- The essence of modern science: Tempt failure by trying to show that a set of observations is not consistent with your hypothesis. If this test fails, then you can say that “the observations are consistent with the hypothesis.”
- Aim not to be right, but to be not wrong. Or, expressed as our slogan:

  **Slogan:** *Aim not to be right, but to be not not right.*
Empirical research: Six big ideas

5. Abstractions can be tested only by making them concrete

- If an abstract idea correctly describes the world, then we should see evidence of the idea in the concrete organization of the world.
- While theories are abstract ideas, theories can be tested only by making predictions that have observable consequences.
- Predicting things that can’t be observed won’t allow you to test your theory. In order to test an idea, we need to predict things that can be observed.
- Transforming abstract ideas into concrete observations is called *operationalizing*.
- **Slogan:** *Test hypotheses by operationalizing terms.*
Empirical research: Six big ideas

6. Compare actual observations with control observations

- Most people who catch a cold feel better in three or four days. Suppose you catch a cold and take a drug. You feel better in three or four days. Did the drug contribute to your recovery?
- If you always took this drug whenever you caught a cold, how would you ever know whether it was useful or useless?
- When making observations, ask yourself, “What would one normally see without this change or intervention?”
- In order to determine whether a drug helps you recover from a cold, you must compare the effect of taking the drug with what would happen if you didn’t take the drug.
- Each time you get a cold, count the number of days before you recover. Take the drug only every second illness. If the drug is effective for you, then it should, on average, shorten the duration of the colds when you took the drug compared with the colds when you didn’t take the drug. In this research, you will compare the results for the treatment condition against the control condition.
- We learn things only by comparison. All empirical research involves comparing two or more situations, measurements, or conditions.
- **Slogan:** Compare, compare, compare.
Empirical research continued: Questions, theories, conjectures, and hypotheses

• Questions
  – A question is an expression of inquiry that invites or calls for a reply. Research is typically motivated by a question.
  – “Why do Beethoven’s metronome markings seem so fast?”

• Conjectures
  – A conjecture is a supposition, prediction, or speculative claim made about the world.
  – Conjectures are not directly testable.
  – “The first musical instruments were probably drums.”
Questions, theories, conjectures, and hypotheses (continued)

• Hypotheses
  – A hypothesis is a testable conjecture. It is a claim or prediction that can, in principle, be compared to existing or future observations.
  – “The music people experience as adolescents will remain the most emotionally important music throughout their lives.”

• Theories
  – A theory is an explanatory framework for understanding a set of observations. Theories typically propose some cause—as in “X causes or influences Y.” Theories often involve words like “because,” “due to,” “affects,” “influences,” or “causes.” Some theories may be untestable. Theories are often used to generate conjectures and hypotheses.
  – “The reason why music from adolescence is so memorable is because of the high levels of the hormone oxytocin experienced during adolescence.”
Group task: Is it a question, theory, conjecture or hypothesis? (or none)

- Why do performers tend to slow down at the ends of phrases?
  - This is a question

- Beethoven’s metronome markings are too fast because his metronome was broken.
  - This is a (small) theory: it proposes a causal explanation. Note the use of the word “because.”

- Much of the popularity of World Music is due to commercial exploitation.
  - This is a theory: it proposes a causal explanation—although the mechanism of influence (“commercial exploitation”) may be a bit vague. Note the use of the phrase “due to.”
Group task: Is it a question, theory, conjecture or hypothesis? (or none)

• How is it that listening to music can sometimes cause shivers to run up and down your spine?
  – This is a question

• The language we use shapes the way we think.
  – This is also a theory. Note that the word “shapes” could be replaced by “affects” or “influences.”

• Brahms uses a lot of hemiolas in his music.
  – This is a hypothesis. It is easily tested.

• Brahms likes hemiolas.
  – Unless Brahms wrote a letter or otherwise communicated that he “likes” (or dislikes) hemiolas, it would be difficult or impossible to determine what he “likes.” Consequently, it is better to call this a conjecture rather than a hypothesis.
Group task: Is it a question, theory, conjecture or hypothesis? (or none)

• Africans have a better sense of rhythm than Europeans.
  – If you think “sense of rhythm” is not possible to measure, then this is a conjecture. Otherwise it is a hypothesis.

• The music of Carl Nielsen echoes the spirit of the Danish people.
  – As written, this statement allows for several different interpretations. It is often helpful to try rewriting a statement in order to gain some clarity. For example, we might rewrite this statement as follows: “The Danish spirit is echoed in the music of Carl Nielsen.” This suggests that being Danish influenced Nielson’s music. Formulated this way, the statement would be regarded as a theory.

• Music can make people happier.
  – This is a conjecture or hypothesis.
Group task: Is it a question, theory, conjecture or hypothesis? (or none)

• Raag Shree sounds sad to experienced Indian listeners.
  – This is a hypothesis. In principle, this claim could be easily tested.

• The music of the Lakota has been influential primarily because of frequent portrayals of Plains Indians in Hollywood films.
  – This is a theory: it proposes a causal explanation for the widespread influence of Lakota music. Note the use of the word “because.”

• The purpose of our research is to study the relationship between music and ritual.
  – This is not a question. It is not a theory since no cause is proposed.
  – It could be construed as a conjecture or hypothesis if there were some doubt about the purpose of the research (say, if two collaborators were arguing about what they are doing). e.g.,
    Researcher 1: The purpose of our research is ... music and ritual.
    Researcher 2: No, no, the purpose of our research is ... music and dance.
  – But this is a stretch. The best answer is “none.”
Empirical research: Six big ideas

#5: Abstractions can be tested only by making them concrete

- If an abstract idea correctly describes the world, then we should see evidence of the idea in the concrete organization of the world.
- While theories are abstract ideas, theories can be tested only by making predictions that have observable consequences.
- Predicting things that can’t be observed won’t allow you to test your theory. In order to test an idea, we need to predict things that can be observed.
- Transforming abstract ideas into concrete observations is called operationalizing.
Operationalizing

• Operationalize this: Listening to Mozart makes you smarter.
  – Who are the listeners? NYU grad students?
  – What exactly does “Mozart” entail? His piano sonatas?
  – What does “listening” mean? How much? How long? In what situations?
  – What does “smarter” mean? Higher IQ? Better math scores?
Group task: Operationalizing

- Would an interval starting from one scale degree be more memorable if it were starting from a different scale degree?
  - What sort of scale? Atonal, diatonic??
  - What interval?
  - What does “memorable” mean? How is that tested? How long do you have to remember it?
  - Example: Is a tritone more memorable if it starts on a major scale degree other than ^4 or ^7?
  - Is a minor third easier to differentiate from its major counterpart if it begins from ...
  - Task: recognizing that interval from others (e.g., P5, P4...).
  - e.g., putting tritone in different contexts; also tonicization.
  - Is it easier to identify a tritone in an expected context vs. unexpected (where there is a tonal violation/not in key)?
Group task: Operationalizing

• How do melodic contours in speech differ based on emotional sentiment?
  – What kind of sentiment?
  – Which languages?
  – Details about the melodic intervals
  – Felt vs. perceived emotion
Group task: Operationalizing

• How much uncertainty in melodic phrases do listeners find most pleasing?
  – Quantifying levels of uncertainty
  – What kind of melodic phrases? How long are they? What style?
Group task: Operationalizing

• How does music affect shoppers in a retail environment?
  – What kind of music?
  – What time of year?
  – What type of retail environment?
  – What demographic?
  – What does “affect” mean?
Group task: Operationalizing

• How does harmonic structure in R&B music contribute to listener preference?
  – What does harmonic structure mean? Level of harmonic variety?
  – Too much change vs. less change?
  – How many times does it modulate?
  – What kind of listeners? People who typically listen to R&B?
  – What is R&B?
  – Preference: depends on mood of subject? So more than one rating over time? Testing for consistency?
  – “Preference” in what context?
  – What does the stimuli sound like?
Group task: Operationalizing

• How is syntax in music different than syntax in language?
  – What is the definition of syntax in music/language?
  – This is very broad question – needs to be more specific.
  – Make question more meaningful: how are they similar rather than different.
Group task: Operationalizing

• What kind of information can be best conveyed through music, and what musical and acoustic parameters are best for conveying that information?
Group task: Operationalizing

• How does perception visual scene differ in musical vs. non-musical environments?
Group task: Operationalizing

- How does noise in urban environments affect us?
Thompson, Chapter 5: Music Acquisition

- The effects of music on a human fetus
- Active and passive forms of learning and their role in musical development
- Studies for evaluating the sensitivity of preverbal infants to various attributes of music
- Musical attributes for which infants show early sensitivity vs. musical attributes for which sensitivity emerges later in development
- Two ways in which early sensitivity to consonance and dissonance is manifested
- Development of sensitivity to harmony and key
Article: Hannon & Trehub, 2005

• Discussion leaders: Michael Rose and Jason Rostkowski
Reading questions: Nature vs. nurture

• Even though the literature states that enculturation begins in the early school years, does the Hannon & Trehub (2005) finding on North American infants’ similarity to Bulgarian and Macedonian adults’ response to alterations in metrical structure, thoroughly disprove the influence of nurture (vs nature) during gestation? Might this be a factor that should be addressed in such a study? (John)

• I’d like to have seen an experiment that tested Eastern European people who were not exposed to "simple" meters in a major way. Does this process via enculturation go both ways? Or are "complex" meters actually more complex, simply leaving Western music-enculturated people without the innate ability to process that kind of meter? (Kyle)
The study's findings suggest that the infant human's brain is somewhat malleable in terms of what rhythmic patterns it will prefer at a later age, or apply bias to in analysis. Thompson indicates in the Chapter 5 reading that more universal structures are acquired earlier, and more unique cultural music is slower to learn. Is the historical spread of Western music across the world (colonialism, imperial expansion) the only reason for its global popularity? (Ned)
The article says that recognizing the 3+2 rhythm in Bulgarian music poses "no apparent problems for adult and child singers and dancers" from [Bulgaria and Macedonia].” Would a listener from another group, a North American for example, recognize the pulse every 5 beats or simply not recognize the structure at all? (Federico)

Can active measures (i.e. regularly playing music from other countries in addition to the inevitably heard Western music) be taken against the effects of enculturation? Or is culture-specific music too prevalent to prevent biases? (Sarah)
Reading question: Subject background

• It talks about the ages of the participants, their sexes, how long they have been training in music, etc. Why weren't the numbers in Experiments 1+2 the same? Why weren't the sexes the same? How would that change the outcome? Does sex factor into the equation? What about the fact the North Americans had a greater mean of 5.7 v. 3.4 years of music training to the Eastern Europeans? 2 years of training does make a tremendous in understanding music difference. Would the instrument involved in the training make a difference (ie. flute v. percussion) What about the infants only being from Northern America. Would infants 6 - 7 months from Bulgaria or Macedonia respond different to the tests? (Blake)
While they claim a relationship in meter (3:2 ratio) between Eastern European music and music of other non-Western regions, the non-Western tested subjects were still in Europe, located relatively close to the origin points of Western music compared to other potential areas of the world. It is feasible that infants might still be exposed to some Western music passively even if it was never a significant part of their lives relative to their own culture's music. Would Hannon get the same results if testing infants and adults from African, Middle Eastern, and/or Asian cultures? (Ned)
Reading questions: Results

- What could be to blame for Experiment 1's subjects' ability to detect changes from typical to atypical structures, but not the other way around? (Sarah)
Reading questions: Methodology

• Compared to the 50 North American adults and 64 infants, there are only 17 first or second-generation Bulgarian or Macedonian participants. Why is the number of participants in Experiment 2 significantly smaller than that of Experiments 1 and 3? Would experiment results vary in any way if there were 50 - 60 participants for Experiment 2? (Alison)
Reading questions: Future work

• At the end of the study, the authors concluded that perceptual reorganization of speech occurs in infancy and that the reorganization of musical pattern might develop the same way. The next step would be to document the "reorganizational skill development", but what could be the methods for the observation and documentation? (Taihua)
Reading questions: Aesthetics

• Regarding the cognitive aesthetics of complex rhythms: if people prefer loud music (refer to the loudness war phenomenon that has occurred over the past 20 years) because it "saturates the auditory system, causing neurons to fire at their maximum rate" (in Daniel Levitin's *This is Your Brain on Music*, p.71), why don't most people prefer complex melodies and complex rhythms as well, for neurons certainly also fire in a high rate to process the music? Must we listen to complex music with an active listening mind that involves thought? (Chi)
Reading questions: Future work

- It seems plausible that infants give almost equal attention to rhythmic disruptions of any kind; how could we isolate the ability to process complex meters? Furthermore, could we identify the critical period for learning rhythmic hierarchies/systems, much like the learning periods for key and harmony have been distinguished?
This experiment focused on responses to either structure-preserving or structure-violating alterations to a piece of music; namely whether or not measure length was preserved. Could we conduct a similar experiment regarding the melodic and harmonic differences in musical cultures? Suppose, if we were comparing change-sensitivity between Western and Indian classical melodies, how would we control the differences in scale for an experiment? (Jason S.)

It seems plausible that infants give almost equal attention to rhythmic disruptions of any kind; how could we isolate the ability to process complex meters? Furthermore, could we identify the critical period for learning rhythmic hierarchies/systems, much like the learning periods for key and harmony have been distinguished? (Jason S.)