Musical Skill
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(Psychology 401: Memory and Skill, 9/27/2011)

Characteristics of Music
• Unique to humans
• Universal – all cultures have music
• Shares a number of similarities with language
  – Musical notes are analogous to phonemes
  – Music has a syntax
  – Music has meaning, but different than language
  – A form of communication

Characteristics of Music
• Rhythm
  – Grouping
  – Beat and Meter
  – Tempo
• Pitch
  – Scale
  – Contour
  – Interval
• Timbre – Sound Quality

Beat, Meter, and Tempo

Example of Complex Meter ...
http://en.wikipedia.org/wiki/Money_%28Pink_Floyd_song%29

Characteristics of Music
• Musical scales and melodies are represented in terms of frequency ratios (Burns, 1999)
More on pitch organization
• Nature of frequency ratios differs for distinct musical cultures
  – e.g., Number and size of scale steps
• Layers of representation for musical melody
  (Handel 1989):
  – **Up-down pattern**: Whether successive notes are e.g., higher, lower than other notes  **ALL cultures**
  – **Interval**: Distance between notes, cf. a specific frequency ratio  **SOME cultures**

Music as a Skill
• **A Listening Skill**
  – Fine-grained pitch and temporal processing ability
  – Absolute and relative pitch ability
  – Rhythm perception ability
• **A Motor Skill**
  – Fine-grained temporal control
  – Sensorimotor coordination
• **A Cognitive Skill**
  – Sight reading ability
  – Musical communication

General Questions about Musical Skill
• What is innate?
• What is a product of enculturation?
• What requires training/formal practice?
• What role does cognitive ability play?
• What are general benefits of music training?

Case Study: Joshua Bell
• [http://www.youtube.com/watch?v=7C-ukopBX6g](http://www.youtube.com/watch?v=7C-ukopBX6g)
"I was more than into video games. I was addicted. Really, looking back, I think I had a severe addiction, with all the classic symptoms of anxiety and release and things that go along with it. I remember going out the back door of the music school where I should have been practicing. My mother would drop me off and I’d go out the back and literally break into a sprint to get to the arcade, feeling that rush of like—’I’ve never done drugs but apparently it’s like that’—I’d walk into the arcade and I’d just feel this euphoria."

Effects of Music Training
• **Examples of Behavioral Changes**
  • Improved pitch processing (Schon et al., 2004)
  • Better recognition of speech in noise (Parbery-Clark et al., 2011)
  • Better temporal discrimination (Jones & Yee, 1993)
  • Better encoding of melodic contour and interval structure (Fujioka et al., 2004)

Effects of Music Training
• **Brain Changes**
  • Increased gray matter in primary motor, pre-motor, and auditory cortices (Gaser et al., 2003; Schlaug et al., 2005)
  • Larger corpus callosum volume (Hyde et al., 2009; Schlaug et al., 1995)
  • Increased neural responses in auditory cortices (Pantev et al., 1998)
  • Enhanced brainstem response (Strait et al., 2009; Parbery-Clark et al., 2011).
Why would musical skill benefit speech?

The OPERA Hypothesis (Patel, 2011)
• Overlap
• Precision
• Emotion
• Repetition
• Attention