Fall 2011 Sabbatical Report: Music and Cognition

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Prologue

I would like to thank the Board of Trustees of the Ventura Community College District; Dr. James Meznek, Chancellor; Dr. Pam Eddinger, Moorpark College President; and the Moorpark College Academic Senate; for this opportunity for scholarly study during the Fall 2011 semester.

The contents of this report include the following:

1) The Sabbatical Report: A brief overview of content researched during the sabbatical
2) Applications: Ideas for incorporating music into an introductory psychology course and the outline of the interactive lecture presented to students on Multicultural Day April 10, 2012.
3) Conference Schedule: The schedule of the Society of Perception and Music Cognition, held August 11-14, 2011.
4) Bibliography: A complete list of readings referenced or read during my Fall 2011 sabbatical.

Music and Cognition: Fall 2011 Sabbatical Report

Music is an integral part of the human experience, yet it largely omitted from introductory psychology texts (Sloboda & Juslin, 2010). It is not, however, omitted from students' lives. Music accompanies them as they socialize, shop, work, exercise, and worship. Music directs their thoughts and emotions in the films they see and the songs that they hear. How does this occur and what gives music such power? This sabbatical project was designed to better understand the underlying mechanisms of experiencing music and thus apply psychology to one of the passions of students' lives.

Research on how music creates meaning to humans is relatively recent. The study of psychology, however, is not; the first official scientific study of psychology was conducted by Wilhelm Wundt in 1879 in an attempt to study reaction time and components of consciousness as it occurred. Wundt was interested in the experience of music as well. Helmholtz, another early researcher on reaction time, also studied music and noted that Helmholtz (1863, 1885) notes that "consonance is a continuous, dissonance an intermittent tone sensation. ….rough and annoying to the auditory nerve" (as cited in Peretz & Zatorre, 2009, p. 137).

Why then, has music been neglected for so long? Perhaps because music universally evokes an emotional response, it has been put in the same basket as emotions—something to be overcome or at best, frippery and superfluous to human functioning. A scholarly body of literature is now burgeoning but only started in the early 1990s, coinciding with the recognition of the importance of emotions in human functioning and also the increased ability of modern neuroscience to study brain function. Such research shows that music involves multiple topics within the study of psychology, including neuroscience, emotions, perception, lifespan development, and social psychology.

From August 2011 to December 2011, I completed the following:

- Joined the Society for Music Perception and Cognition, the leading organization of scholarships in areas of music, neurology, and psychology
- Attended the biennial SMPC conference at the Eastman School of Music in Buffalo, New York in August 2011 (see Conference Schedule)

- Conducted independent research (see Bibliography)

Since then, I have presented an interactive lecture on Music and Conflict at Moorpark College Multicultural Day 2012 (see MC Day Lecture) and will contribute to a panel discussion about my Sabbatical during Fall 2012 Flex Week. This report is a very brief overview of what I have learned and suggestions for applications to Introductory Psychology (as well as other psychology) courses.

Psychology and Music

Experiencing music involves many, if not most, of the topics studied in introductory psychology, including memory, lifespan development, brain and behavior, perception, social psychology, memory, learning and conditioning, research methods, health and stress, and abnormal psychology. Perhaps one of the most valuable aspects of using music to better understand psychology is that none of the above topics occur alone; to understand how music works, one needs to understand the basic function of each psychological component. With that in mind, I have provided very brief summaries of major areas in which music related to psychological topics.

Brain and Behavior

Music, as with any other human thought or behavior, originates in the brain. Consequently, applying the experience of music to brain structures and mechanisms is a "no brainer," so to speak. The problem is more with determining how much detail to include so that introductory psychology students can relate to, rather than be overwhelmed by, the topic. In any case, understanding how music is perceived and functions within their own brains is a useful application that can make the study of brain and behavior more meaningful. What follows is a very simple representation of brain activation when experiencing music.

Music processing activates four general systems in the following order (Menon & Levitin, 2005, p. 126):

a. The a*uditory cortex* , buried in the Heschl's gurus in the *temporal lobe*, analyzes sound (Tan, Pfordresher, & Harre, 2010, p. 58).

b. *Frontal regions, in the frontal lobe,* process musical structure and creates meaning out of at least 13 different musical components, including the instrument(s), grouping of notes, the beat, and the tonality (i.e., major or minor), all of which are processed near instantaneously. Here music differs from language in an important way; language conveys meaning about something else (i.e., has semantic meaning), but music does not. As such, it stays in the memory longer than language (Patel in Peretz & Zatorre, 2009, p. 332).

c. The *mesolimbic system*, involved in arousal pleasure, is activated and produces dopamine, which activates the nucleus accumbens (NAc).

   i. Different parts of the *amygdala* are activated, depending on whether the music is pleasant or unpleasant (Koelsch, 2010, p. 133).

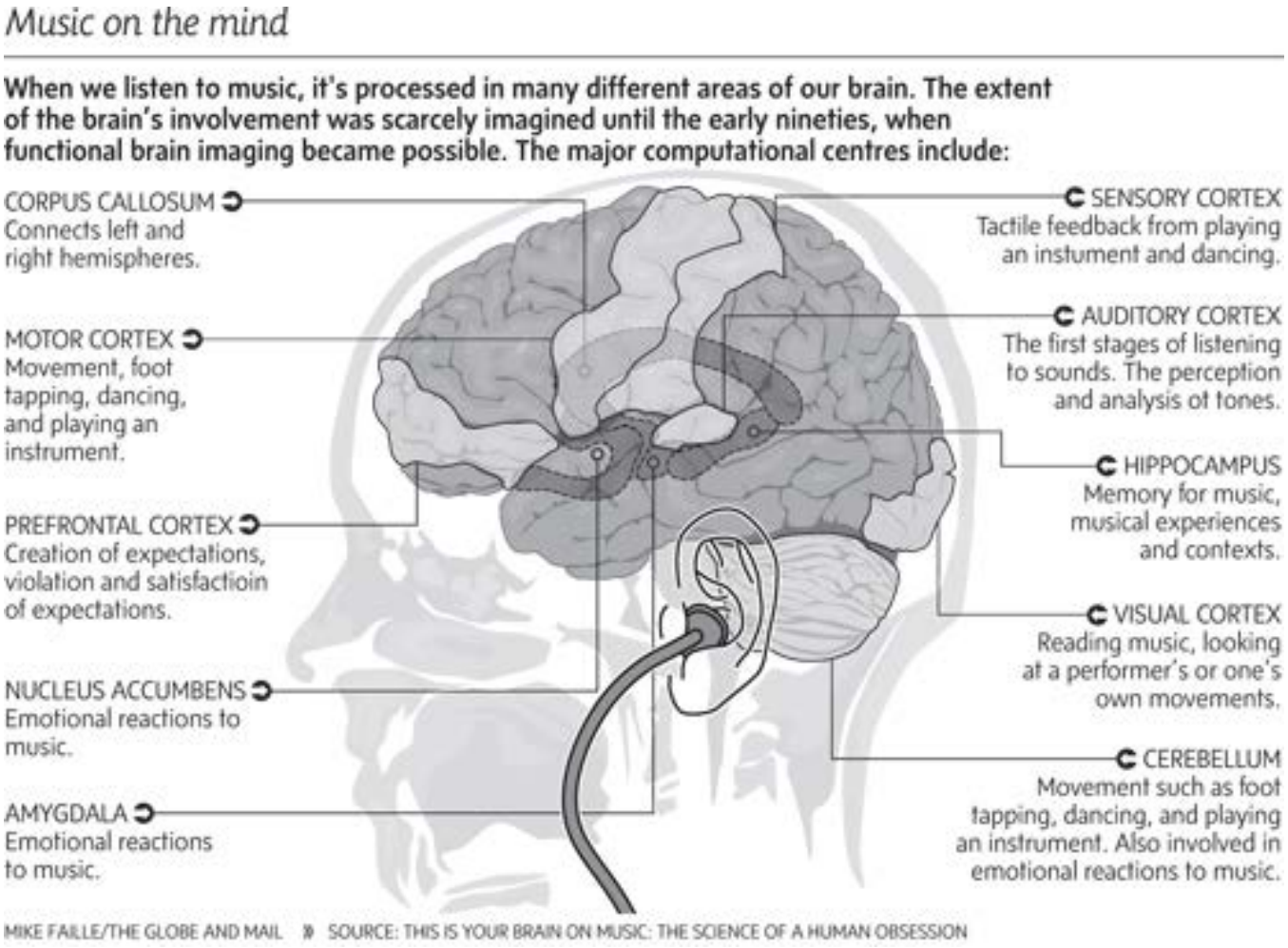
   ii. The pleasure experienced when listening to music can be compared to other experiences that activate the NAc pleasure-reward system include sexual activity, drugs, eating chocolate, and quenching thirst. (Koelsch, 2010, p.134). When the NAc receives information from the limbic system, it produces dopamine, which initiates locomotion and thus affects learned behaviors. It is thought such motor-related function is related to most common physical reaction to music—to dance (Koelsch, 2010, p. 133).

   i. The *cerebellum and basal ganglia* process rhythm and meter leading to movement. Music and language employ many overlapping structures but music also involves those primitive brain functions such as motivation, rewards, and emotion (Menon & Levitin, 2005, p.187). The *cerebellum*, a center for learned movement, has many connections to the limbic system, or center for emotions. It is thought that the rhythmic component of music starts the emotional process in the cerebellum and sending messages to the limbic system (Menon & Levitin, 2005, p. 58).

   ii. The *hippocampus* is brain's "memory center" but plays an additional role in music processing. It is thought that the hippocampus generates emotions other than the

"pleasure" of the amygdala and NAc and is actually a separate system. Koelsch (2010) presents evidence of the role of the hippocampus in emotional functioning. He notes that the hippocampus can suffer damage when exposed to negative emotions, but that when experiencing "tender" emotions (such as joy and happiness) such damage is reduced (p. 135). Dissonant, or scary, intervals stimulate the part of the hippocampus that connects to the amygdala, perhaps as a warning. When the amygdala has been removed, patients could not identify whether music was happy or sad (Tan et al., 2010).

The following diagram provides an illustration of more specific functioning within the general systems described above.



Abnormal Psychology, Therapy, and Health and Stress

Considerable research supports using music to promote health and treat physical and mental disturbances. Introductory psychology textbooks typically include anxiety disorders and mood disorders, two of the most common disorders in the general population. The growing field of Music Therapy specifically focuses on such treatments, but music is used by other practitioners as well. The core of music therapy of any kind is the evoking an emotional response but more specifically, different models of therapy suggest that it works through developing new neural patterns (Meyer, 1956, as cited in Juslin & Sloboda, 2010), and changing arousal responses in several domains, including EEG, motor responses, and autonomic responses (Berlyne, 1971, as cited in in Juslin & Sloboda, 2010). The following are some specific uses of music therapy:

1. Music is related to how we think, or cognition, and can help change dysfunctional thinking and thus change behaviors in those with depression, obsessive thoughts, and anxiety. Thaut and Wheeler (2010) note that "music can influence, shape, and educate cognitive, affective, and sensorimotor processes in the brain that can also be transferred and generalized to non-musical brain functions within a therapeutic model" (p. 823).
2. Clinicians use different modes of therapy to treat those with mental disorders. Some of these include behavioral therapy (in which patients learn to change what they do as opposed to what they think), psychoanalytic therapy (in which patients delve into the past to discover buried conflicts), and humanistic therapies (in which patients are encouraged to reframe their conflicts and develop their own solutions). All of the treatment methods have been facilitated successfully by music (de l'Etoile, 2009).
3. Music therapy has been successful is working with those needing neurological rehabilitation such as strokes as well as degenerative illnesses. Called Neurologic Music Therapy (NMT), it has also been applied to sensorimotor rehab, speech and language rehab, and cognitive rehab (Leins, Spintge, & Thaut, 2009). New research shows that music helps re-organize neural

pathways by the use of rhythm, processing new neural patterns, employing different areas of the brain, and creating emotional responses that promote motivation.

4. Anxiety in general is a common human condition that music can help alleviate (Kenny & Ackermann, 2009). Much of the study on music therapy has centered on *performance anxiety* but a related use is towards alleviating *social anxiety*. Performance anxiety in particular is frequently stated by students as they greatest fear—speaking in front of the public.
5. In addition to treating problems, music can promote health. Research connects music to relaxation and stress management, improved immune function, neurotransmission (including serotonin, dopamine, and endorphins—the "feel good" neurotransmitters) (Hansen, 2010). Serotonin and hypothalamus activity increases when listening to pleasant music, thereby increasing immune function. On the other hand, the stress hormone cortisol is decreased when actively making music, with the same result (Thaut & Wheeler, 2010).
6. Music facilitates childbirth, relieves the stress and pain of cancer, coronary heart disease, and is used to help manage pain (Hansen, 2010).
7. Music is also used in Neonatal Intensive Care Units or NICO for helping prevent weight loss in premature infants and also managing parental depression (Tan et al., 2010).
8. Finally, music promotes positive aging when promoting community participation in musical events by helping the elderly maintain their self-identity and promoting physical and emotional well-being (Hallam & MacDonald, 2009).

Memory and Learning

Music "unfolds over time," which means that it is uses short term, or working, memory. However, we remember melodies—sometimes forever—so clearly mapping occurs that allows long-term memory storage and subsequent retrieval. Research provides evidence that they systems for remembering music and language are different; because language carries semantic meaning, it is more easily forgotten whereas music only refers to itself. Peretz and Zatorre (2005) suggest that a "perceptual representation system" allows more easily remembering form and structure, but not meaning. They

showed through transcranial magnetic stimulation to the left frontal cortex that speech stopped but singing did not, thus showing different systems for speech and singing.

Much of our intense memories—and fondness for certain songs and types of music—occurs through classical conditioning, in which a neutral stimulus (such as an unknown piece of music) is paired with an event that evokes strong emotion. One this process occurs, just hearing a song will bring unbidden the memory and associated emotion of that event (or person). A classic example of this is the theme music to the film *Jaws;* when the film was popular, just hearing the ominous repetitive minor seconds elicited a feeling of anxiety and dread.

Cross-cultural psychology and social psychology

However much cultural practices differ, humans have core abilities and characteristics that are the same worldwide. Music exemplifies this in several areas. First, humans appear to be born with fundamental musical abilities that are not taught by a culture. Second, music in general may sound very different in different cultures but all music shares certain components such as a varied step scale, the use of major second intervals and octaves (Tan et al., 2010). In addition, research has shown that people can recognize emotional content in music from a different culture, even when the tonality, words, and musical structure is very different. For example, Western students unfamiliar with Eastern music could recognize sad and happy expressions in Indian ragas, even though on the surface there seems to be nothing in common with western music (Tan, et al., 2010).

An additional area shared by most cultures is the use of music. Throughout the world, music is generally a social event. It brings people together, creating community. The follow are some of uses of music across most cultures:

1. **Social bonding and celebration:**
    a. Music can reduce testosterone levels (which drive aggression), thus contributing to group harmony and unity (Huron, 2009).
    b. Most popular song in the world is *Happy Birthday*, a celebration of individual achievement within the group (Huron, 2009).

2. **Nationalistic spirit:**
    a. Wagner and Hitler are a famous duo; Hitler chose *Der Meistersinger* to accompany the inaugural celebrations of the Third Reich in 1933, it was used by Leni Riefenstahl in her propaganda films, it was conducted on film by Wilhelm Furtwängler to symbolise the greatness of Germany's war effort, and it was the only piece performed at Wagner's theatre in Bayreuth during the war years (Garofolo, 2010).
    b. Some of our own cultural nationalistic music include the National anthem, team music at sports games, and protest songs.
3. **Religious worship:** In all cultures, music has some connection w/ religion and the supernatural perhaps because it creates awe, inspires emotion, and can lead to trance-like states (Bicknell, 2009).
4. **Coordination of group work:** Music makes light of heavy work. Consider music and changes used in military exercises and music on slave plantations—one of the few freedoms experienced by slaves.
5. **Transmits culture**: All cultures have fold songs that express legends or values. In addition to plantation gospel songs, American folk music tells of early railroads, migration, and times of oppression.
6. Traditionally, **music is always associated with dancing**! Hearing a rhythm gets creates rhythm within us as well, a process called *entrainment*. Rhythms activate primitive sections of brain that stimulate movement, which brings pleasure and energy. Historically music and dance were inherently linked. This is no longer true in American culture but remains so in much of the world.
7. **Marketing:** An inherent application of social psychology is studying how retailers guide human behavior. Music is often a key tool; research shows that people eat different foods, visit stores, choose different products, and shop at different speeds, depending on the type of background music (Tan, et al., 2010; North & Hargreaves, 2009).

8. **Recreation:** Music is an essential accompaniment to film, though still neglected in psychological study (Cohen , 2010). Early film accompaniment was intended to help relax viewers but soon it became a "third dimension" of the film experience (Cohen, 2010). Music guides emotional reactions, but the audience is often unaware of the effect or even the existence of the musical soundtrack. One interesting study by Bullerjanh and Guldenring (1994, cited in Cohen, 2010) created five differently themed background scores for the same 10-minute film clip. When queried, viewers cited different emotional reactions, film genre, protagonist rationales, and even intended film ending, depending on the type of music (Cohen, 2010). Music serves other purposes in film; it masks outside noises, connects scenes, directs attention to important features, furthers the narrative, and intensifies immersion into the story (Cohen, 2010).

Lifespan Development

One of the interesting aspects of music is that it is not all learned; that is, human apparently come into the world with some basic music processing abilities. Infants, for example, recognize consonance and dissonant intervals (and prefer the former) and very early can respond to and move with rhythm. "Infant-directed speech" is common across all cultures; even though different words are used, everywhere is it characterized by rhythmic speech using similar pitch contour, similar to music (Trehub, 2009). Such communication communicates synchrony, a type of parent-infant dance that promotes emotional development. Similarly, lullabies are universal. Fascinating research with attachment (the early bond that provides a basis for lifelong emotional health) shows that mothers communicate with their babies even in utero through movement and music, which supports the beginnings of music sensitivity and attachment emotions (Parncutt, 2009). Thus, much of the research on early musical abilities suggests universality of basic processing, although the culture will determine the type of music learned and preferred.

Some specific age-based abilities include the following accomplishments by:

- 2 months: prefer harmonic intervals and can recognize tones that don't fit into a harmonic pattern

- 3-6 months: can imitate pitches prefer harmonic intervals by 2 months and can recognize tones that don't fit into a harmonic pattern very early .
- 4-6 months: chuckle or coo when hear music
- 6 months: babbling response to music; wider variety of syllables and greater variation in pitch than speech babbling. Pitch usually centered on F above Mid-C, about 1 8ve. Pitches not tonal and rhythmically amorphous
- 2-3 years: spontaneous singing. "Potpourri songs"-fragments of words, rhythms, melodies of conventional songs; spontaneous. By 3-singing to imitate a model-first words then rhythm, then melodic contour.
- 4-5 years: general features of familiar musical genres. Know a small repertoire of conventional songs. By 5-basic song-singing skills in place including general tonal center and expression (Tan, et al., 2010).

In childhood, music training can increase IQ scores as well as memory (Schlaug, 2009). As stated in the "therapeutic" section, children with problem behaviors or disorders are helped by music. In adolescence, music helps promote adolescent identity development as the adolescent chooses type of music and the associated persona to represent themselves (MacDonald, Hargreaves, & Miell, 2009). Indeed, Levitin (2007) notes that adolescence is the "turning point" for developing new musical interests, perhaps due to neural pruning that occurs at this age. Subsequently, most of us have developed a clear preference in music by early adulthood and consider music of that time as permanently meaningful (p. 227).

But music is not just beneficial or evident in children. Music study, even when not pursued, can actually protect the aging brain, shown in ongoing research at Northwestern University (among others).

Emotions

The defining characteristic of experiencing music is that it evokes an emotional response. Oddly, the emotional aspect of music is perhaps the least researched, perhaps because people do not agree on a clear definition of emotion. We know the mechanisms for experiencing emotion and pleasure, but exactly *what*

prompts this to occur? Most researchers agree that emotion from music is likely a multifactorial process. Juslin (2010) provides the following model that includes multiple factors of human experience.

1. **Brainstem reflex**: The auditory system inputs to the intralaminar nuclei of the thalamus, and the the reticular formation. The brainstem regulates physiological responses involved in emotion.
2. **Evaluative conditioning**: Like classical conditioning, an event is paired with music (sometimes unconsciously while doing something else), so every time the music is heard again, the feeling returns. *Note that this is an environmental influence and NOT an inherent brain reaction to any specific in the music.*
3. **Emotional contagion:** The listener first perceives the intended emotional expression and then 'mimics' this emotion internally until felt. This process might involve mirror neurons.
4. **Visual imagery:** Listening evokes images that have emotional content.
5. **Episodic memory**: Similar to emotional contagion, a specific event is paired with music, so that hearing the music evokes that memory and the attendant emotion. This relates to the role of music adolescent identity development and the subsequent power of music at the age.
6. **Music expectancy**: Emotional reactions can be triggered when music changes key or when jumps in the melodic line occur unexpectedly.

Conclusion

There is not one aspect of psychology that determines how we experience music. Rather, when experiencing music we use multiple brain systems that integrate and overlap with nearly every topic taught in psychology. This report barely touches the surface of what I have researched and learned. I am deeply grateful for this opportunity for scholarly study.

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MUSIC AND CONFLICT

An interactive presentation on the value of music to reduce conflict with musical examples

Presented: Tues 4/10 1-2:05 pm at Moorpark College in Fountain Hall Room 111

I. Introduction. Today—I hope to be fun, learn a little more about music, and talk about your musical experiences and what is important to you.

   a. *Who likes music? When do you listen to music and why?*

   b. *Do any of you ever have an emotional reaction to music? What?*

II. Let's start with a mystery… How does arrangement of sound evoke or create meaning and emotion? *What is music?*

   a. How is it different from speech?

   b. Involves pitch, rhythm, melodic contour. Speech?

   c. Uses different areas of brain then speech (although words processed in same areas).

III. Background. Music is not just something we enjoy today.

   a. Music part of any culture ever studied...and musical instruments found indicating it probably existed for earliest humans. At least 50,000 years old. Earliest instrument (flute) found in Neanderthal site.

   b. Some cultures, such as ancient Greek cultures, though music so important in shaping people's minds that they considered it one of the four essential components of education (*quadrivium)*--

      i. Two aspects—

         1. music moved the passions, either for good or not;

         2. But also--music embodies the natural laws of number so reflects abstract aspects of the universe, such as the principles of natural order, or the workings of the divine.

      ii. Music aimed to bend human minds and actions to the purposes of the musician, so it was thought that music reflected human character and thus would be imitated by the

listener. Hence, important for education and to be careful what instruments and music played for the young.

IV. Is our emotional response to music innate? Only in the past 20 years or so have psychologists begun to research the effects of music. So…is it innate to us or do we learn it from our culture? The emotion that we feel when listening to music is different from emotions that come from daily events. More and more evidence supports the innate perspective.

V. We are born with an ear and affinity for music. Babies show early responses and recognition of basic musical patterns and a preference for singing (as opposed to speech). And every culture studied uses lullabies to calm their babies.

VI. Infants respond to music; they can recognize the difference between consonance and dissonance, recognize transposed melodies, tempo changes, and especially melodic contour similarities/differences when separated by time or distractor tones.

a. Infant responses- Cortisol levels decreased more after singing than words, and retained longer

b. Infant-directed speech throughout cultures and preferred by infants. Pitch contour critical. Promotes synchrony between infant and parent.

c. What about singing? Even more so. Can be therapeutic-depressed mothers, heighten infant attention, facilitate daily routines, regulate emotions and arousal levels, electing attention, etc. Babies sing spontaneously around age of one, have large repertoire of songs of their culture by 5.

d. Animals can be calmed by music, but humans are unique; only humans can synchronize their pitches to each other. Even animals that appear to rock to a rhythm can't do this. Also, only humans can recognize the same melody in a different key. This is one of the first abilities demonstrated by babies.

e. In fact, humans are the only mammalian species that can synchronize movement to music (Patel has a cockatoo that can for about 5 sec). Very young infants can do it. Elephants and

chimps can keep a pretty steady tempo when banging on sticks, but not synchronize to each other. Our motor cortex active while listening even if person keeps still.

VII. So if music is universal, how do people use it? Just for pleasure? Can you of some ways that music brings people together? Traditionally, almost always social--

a. Social bonding in general: Can reduce testosterone levels (which drive aggression).

b. Nationalistic spirit; (Handbook Emotion 725-754)

i. Wagner & Hitler: Ex: Die Meistersinger: http://youtu.be/qyv3zrsGlNc. "Music from Meistersinger was chosen to accompany the inaugural celebrations of the Third Reich in 1933, it was used by Leni Riefenstahl in her propaganda films, it was conducted on film by Wilhelm Furtwängler to symbolise the greatness of Germany's war effort, and it was the only piece performed at Wagner's theatre in Bayreuth during the war years." *Problem*: People can be manipulated with music.

c. National anthem--4th of July celebrations. *Glad to be an American* over every radio station...do you get chills?

d. Football games--music excites and revs up the audience

e. Protest songs

f. Religious worship: In all cultures, music has some connection w/ religion and the supernatural.

i. Creates awe; purification of the soul

ii. Inspires emotion, trance-like states.

g. Coordination of group work

i. Slaves on plantations; one of their few freedoms was to sing.

1. Ex: Volga Boat Song (rowing)

ii. Military rhythms

h. Transmit culture: Folk songs. *Can you think of examples?* .

i. Most popular song in the world—*Happy Birthday*.

i. Traditionally, music always associated with dancing! Hearing a rhythm gets creates rhythm in us as well..entrainment. More primitive sections of brain are activated when listening to music: cerebellum, pons, brainstem. Also, historically music & dance inherently linked. No music without dance. In most of world's languages, music & dance same word. Not in ours, though. Music begins with movement; must move something to get molecules moving and thus heard.

i. Ex: Stones, Start Me Up. http://youtu.be/ZzlgJ-SfKYE. Solid rhythm; demonstrates entrainment.

ii. Ex: Guns & Roses, Sweet Child o' Mind. http://youtu.be/NmqK0aXkHho. Nice guitar rhythmic intro.

j. Today, in general, six niches: travel, physical work, brain work, body work, emotional work, and live music concerts. There are four functions that can occur together: distraction, energizing, entrainment, and meaning enhancement (PoM, Ch40).

VIII. Music is used for a lot of other, practical reasons as well.

a. Health--pain management, childbirth

b. Mood disorders,

c. Advertising and guiding consumer behavior:

i. Lewin-says that social surroundings actively guide behavior. Although words do, music does so often unconsciously. Examples of buying behavior in grocery stores and eating behavior in cafeterias with different kinds of music.

ii. Three ways to use music in retail: classical conditioning of emotional responses, priming cognitions about the product, and sonic branding/sponsorship.

d. Films wouldn't be very exciting without music!

e. *Pair/Share—How do you use music*? Give examples.

IX. Emotional management: When using "experience sampling" method, people reported listening to music as if in a film--to accompany and shape emotions and behavior throughout the day (DeNora, 2001 and others, in PoM Ch12). Interacts with hormones…

a. Oxytocin: cements new memories, wipes away old ones. Released after childbirth, during orgasm, and during trauma or ecstasy. Also during trance and while listening to music. This could explain the neurophysical effects when groups sing.

b. Mood regulation: when surveyed, third most reported activity for "getting out of a bad mood." Also to raise alertness and reduce tension. Note that 1st choice is conversing with a friend, social interaction. Second, music prominent in social interaction; non-industrialized societies, almost always in a group.

X. Does music actually provoke an emotional response?

a. Didn't used to think so…thought people just recognized that music was "happy" or "sad", but didn't feel that emotion themselves. Now recognize that music does provoke a genuine emotional response, but not the same emotions as what we feel in everyday life.

b. Most commonly experienced in music is love, happiness, or other "tender" emotions. Also sadness and nostalgia, probably because music can trigger memories. Emotions like 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 (Zenter, 2008, p. 500)

i. Ex: Shoenberg Verklaerte Nacht: http://youtu.be/KfEHohHuoNU (14:06). First few minutes; starts w/ low cello, builds some--dark and lonely.

ii. Ex: Killing Me Softly Roberta Flack: http://youtu.be/O1eOsMc2Fgg

iii. Adele, Someone Like You: http://www.youtube.com/watch?v=8ovfz0AbTeo&feature=related

XI. Has anyone ever experienced chills from music? Ask who has experienced and from what song….

a. Ex: Mozart Piano Concerto No. 23 K488: single piano entrance, just beautiful: http://youtu.be/mf711o8jAQA (6:17). A lot of elisions key to key.
b. They give another example . Titanic Song.
c. Why?
    i. Usually a familiar song, can be tied to a memory or person
    ii. Technical: blood flow to brain areas including dorsal midbrain, ventral striatum (containing nucleus accumbens), insula, and orbitofrontal cort5ex. Some of these areas also involved in highly rewarding or motivationally important stimuli, including food and drug of abuse. Maybe is a class of human constructs that elicits pleasure by co-opting ancient neural systems via inputs from neocortex (Peretz & Zatorre, 2005)
d. Responses similar everywhere; "our bodies are brains are wired to respond to sound and to rhythmic sounds in particular" (126, Koepchen et al., 1992). Entraining bodies to music rhythms brings pleasure (126).

XII. Conclusion: Can music help reduce conflict? They decide--

a. Music brings people together--shared memories and experiences, inspiring music and lyrics
b. Music inspires "tender" emotions--leaving people feeling better about each other then before
c. Music--if not used to manipulate--can inspire people to be better people.

NOTE: This was a full classroom and a very active and interested group! I covered only a fraction of the above material but everyone had a great time!

Teaching Psychology and Music: Ideas for Activities and Discussions

The following are some activity and discussion ideas that can be applied to various topics in psychology. Most can be used as supplements, critical thinking exercises, or introductory activities for a particular topic in psychology in introductory psychology. (Note: These exercises are meant to teach psychology not music). I have included some objectives and topics to which each could apply; note that objectives may depend on the intent of the activity. Many of these activities are best suited to small groups.

Music and the Brain worksheet (see attached)
Description: Students apply different brain systems to a scenario involving a rock band.
Helps students to: Identify, explain, and integrate various neural system structures and functions.
Can be applied to: Neuroscience

Film and Music writing assignment
Description: Students choose a film then listen to the soundtrack to determine: 1) which neural system components are activated, or 2) how the filmmaker is attempting emotional manipulation.
Helps students to: Identify and explain neural system responses, or 2) analyze how emotional manipulation occurs within a common medium.
Can be applied to: Neuroscience, Social psychology, Perception.

Surveys on Music.
Description: Develop a short survey to give to other class members on any number of topics, such as 1) earliest musical memory, 2) role of music in teen years, 3) music in family celebrations, 4) music as part of culture, or 5) how use music in your own life.
Helps students to: 1) Explain role of emotion in memory formation and retrieval, 2) Analyze different emotional challenges (i.e., Erikson stages) in adolescence, 3 & 4) Compare cultural differences among families, 5) Understand the type of questions that produce meaningful data.
Can be applied to: Research methods, cross-cultural psychology, memory, health and stress, and lifespan development.

Music Listening and Response.
Description: Play music samples and ask class for their responses and memories.
Helps students to: Analyze the difference between biological and environmental differences in emotional responses.
Can be applied to: Cross-cultural psychology, nature vs. nurture

Memorize to Music
Description: Demonstrate and practice ease in memorizing by putting to music.
Helps students to: Improve strategies for learning, explain differences between short-term and long-term memory.
Can be applied to: Memory, Study Strategies

Sell a Product
Description: Develop a ditty to sell a common product.
Helps students to: Apply social psychology principles of persuasion.
Can be applied to: Social Psychology

Doctor, Doctor
Description: Develop recommendations for handling stress, relieving test and other anxiety, and improving health, for a given "patient."
Helps students to: Apply stress management techniques to their own lives using a widely-available method.
Can be applied to: Health and Stress

*Listening for Feelings**
Description: Students listen to various clips of music and describe the feelings experiences.
Helps students to: Clarify the differences between basic emotions and secondary, or nuanced, emotions.
Can be applied to: Emotions
*This exercise from http://users.rider.edu/~suler/listenfeel.html.

Babies Can do That?
Description: After presenting information on neonatal abilities, including musical abilities, discuss reasons why nature has equipped humans with fundamental abilities.
Helps students to: Critically evaluate evolutionary theory to psychology.
Can be applied to: Nature vs. Nurture, Evolutionary Psychology, Lifespan Development

I Love that Song!
Description: Play songs known to be "tear-jerkers" (such as the theme from *The Titanic* or evoke other emotional responses (such as the theme from *Jaws).* Discuss why this reaction occurs.
Helps students to: Apply principles of classical conditioning to their own lives.
Can be applied to: Learning and Conditioning.

Sample Worksheet: Music and Your Brain

Consider both the part of the brain and the brain process as you answer the following questions. Note: some of the questions do not have obvious answers…more than one brain part can be involved.

1. You hear the music…but where did it come from? What part(s) of the brain is/are involved in imagining the musical idea, then analyzing the music and writing it down?
2. Many of the band members have been playing guitar for years. What part of their brain is probably larger than those of other people, and why? (hint: what has to coordinate for this skill?).
3. What part(s) of the brain direct(s) the singer's muscles as they gyrate around the stage, and how do the muscles get the message to move?
4. How does the band know that they are singing in pitch, then what helps them adjust so that they sound good?
5. This group really gets into the music….eyes closed, faces grimacing, they wail about lost love. What part(s) of their brain is/are involved in this emotional recollection?
6. One of the players has terrible stagefright, but after starting playing relaxes and gets into the performance. Explain that process.
7. The audience reacts wildly to the music, dancing, crying, and screaming band members' names. What parts of their brains are reacting?
8. After the gig, the band is rushed by the crazed groupies. The band members panic and take off. What part(s) of the brain pick(s) up on this potential danger and helps them react?
9. After leaving their fans in the dust, the band decides to party. Leaving the party, they can barely stand, but they can still automatically play well-know songs. What part of their brain is most likely affected, and why do you think they can still play songs?
10. Sadly, many of the band members have been overdoing the party scene for so long that they can hardly articulate a coherent thought or word. How could you explain this?

Conference Schedule, Society for Music and Perception, Thursday August 11-Sunday August 14, 2011.

Thursday, August 11

Th-AM-I [top]	ABSOLUTE PITCH	EVOLUTION
9:00-9:20	Vivek V. Sharma & Daniel J. Levitin, "Effects of musical instrument on absolute pitch ability"	Lisa Chan, Lucy McGarry, Vanessa Corpuz, & Frank Russo, "An empirical test of the honest signal hypothesis"
9:20-9:40	Psyche Loui, Anna Zamm, & Gottfried Schlaug, "Emotional Judgment in Absolute Pitch"	Richard Parncutt, "Defining music as a step toward explaining its origin"
9:40-10:00	Elizabeth W. Marvin & Elissa L. Newport, "The Absolute-Pitch Continuum: Evidence of Incipient AP without Training"	Leonid Perlovsky, "Musical Emotions: Functions, Origins, Evolution"
10:00-10:20	Ronald Weisman, Laura-Lee Balkwill, Marisa Hoeschele, Michele Moscicki, & Christopher Sturdy, "Identifying Absolute Pitch Possessors Without Using A Note-Naming Task"	Patrick Savage, Tom Rzeszutek, Victor Grauer, Yingfen Wang, Jean Trejaut, Marie Lin, & Steven Brown, "Music as a marker of human migrations: An analysis of 'singing' vs. 'songs'"
10:20-10:40	BREAK	
Th-AM-II [top]	EMOTION 1	CROSS-MODAL EFFECTS
10:40-11:00	Megan Trenck, Peter Martens, & Jeff Larsen, "The Power of Music: Composing Emotions"	Steven R. Livingstone, Caroline Palmer, Marcelo Wanderley, & William Forde Thompson, "Production and perception of facial expressions during vocal performance"
11:00-11:20	Lucy M. McGarry & Frank A. Russo , "The effects of expertise on movement-mediated emotional processing in music"	Manuela M. Marin, Bruno Gingras, & Joydeep Bhattacharya, "Differential effects of arousal and pleasantness in crossmodal emotional transfer from the musical to the complex visual domain"
11:20-11:40	David Temperley & Daphne Tan, "The Emotional Connotations of Diatonic Modes"	Steven C. Hedger, Howard C. Nusbaum, & Berthold Hoeckner, "The message in music: Music can convey the idea of movement"
11:40-12:00	Peter Martens & Jeff Larsen, "Emotional responses to (modern) modes"	Carol Lynne Krumhansl & Jennifer Huang, "Effects of Stage Behavior, Expertise, Composer, and Modality of Presentation on Piano Performance Evaluation"
12:00-14:00	LUNCH	
Th-PM [top]	DEVELOPMENT	TIMBRE
14:00-14:20	Mayumi Adachi, "Effects of interactions with young children on Japanese women's interpretation of musical babblings"	Frederic Chiasson, Caroline Traube, Clement Lagarrigue, Bennett Smith & Stephen McAdams, "Koechlin's volume: Effects of native language and musical training on perception of auditory size

		among instrument timbres"
14:20-14:40	Sandra E. Trehub, Lily Zhou, Judy Plantinga, & Mayumi Adachi, "Age-related changes in children's singing"	Damien Tardieu, Stephen McAdams, "Perception of dyads of impulsive and sustained sounds"
14:40-15:00	Aniruddh D. Patel, John R. Iversen, Melissa Brandon, & Jenny Saffran, "Do infants perceive the beat in music? A new perceptual test"	TALK CANCELED
15:00-15:20	Kathleen A. Corrigall & Laurel J. Trainor, "The Development of Sensitivity to Key Membership and Harmony in Young Children"	Sven-Amin Lembke & Stephen McAdams, "The relevance of spectral shape to perceptual blend between wind instrument timbres"
15:20-15:40	Manuela Filippa, "The effects of mothers' live singing and speaking on preterm infants: Preliminary results"	Glenn Paul & Michael Schutz, "Using percussive sounds to improve the efficacy of auditory alarms in medical devices"
15:40-16:00	BREAK	
16:00-18:30	PLENARY SESSION (PRESIDENT'S ADDRESS, ACHIEVEMENT AWARD, ANNOUNCEMENTS, KEYNOTE LECTURE)	
18:30	OPENING RECEPTION	

Friday, August 12

7:30-9:00	STUDENT BREAKFAST	
Fr-AM-I [top]	IMAGERY / INDIVIDUAL DIFFERENCES	AUDITORY SYSTEM
9:00-9:20	Zohar Eitan & Roni Y. Granot, "Listeners' images of motion and the interaction of musical parameters"	Jordan C. Schramm & Anne E. Luebke, "Musical Aptitude Predicts Ability to Discriminate Music and Speech from Background Noise "
9:20-9:40	Fernando Benadon & Madeline Winkler, "Crossmodal Analogues of Tempo Rubato"	Mathieu R. Saindon, Sandra E. Trehub, & E. Glenn Schellenberg, "Music processing in deaf adults with cochlear implants"
9:40-10:00	Lisa Aufegger & Oliver Vitouch, "Training of instrument recognition by timbre in non-musicians: A rapid learning approach"	Tonya R. Bergeson & Nathan Peterson, "Contribution of hearing aids to music perception by adult cochlear implant users"
10:00-10:20	J. Devin McAuley & Molly J. Henry, "More than just musical ability: Regulatory fit contributes to differences between musicians and non-musicians in music perception"	Peter Cariani, "Interspike intervals, subharmonics, and harmony"
10:20-10:40	BREAK	
Fr-AM-II [top]	SYMPOSIUM: MUSICAL MODELS OF SPEECH RHYTHM AND MELODY	PHYSIOLOGICAL RESPONSES
10:40-11:00	Steven Brown, Ivan Chow, Kyle Weishaar, & Jordan Milko, "The music of speech: Heterometers	Laura A. Mitchell, Jeffrey S. Mogil, Theo Koulis & Daniel J. Levitin, "Music and pain perception:

	and melodic arches"	Investigating the role of attention"
11:00-11:20	Ivan Chow, Matthew Poon, & Steven Brown, "Are tone languages music? Rhythm and melody in spoken Cantonese"	Olivia Ladinig, David Huron, Katelyn Horn, & Charles Brooks, "Enjoying Sad Music: A Test of the Prolactin Hypothesis"
11:20-11:40	Laura Dilley, "When is speech musical? Why we need concepts of meter, melody, and motif to understand prosody in spoken language"	Laura A. Mitchell, Anna M.J.M. Paisley & Daniel J. Levitin, "Validating emotionally-representative musical selections: Relationship between psychophysiological response, perceived and felt emotion"
11:40-12:00	Robert Port, "Rhythmic production of speech and other behaviors"	Finn Upham & Stephen McAdams, "Piece vs Performance: Comparing coordination of audiences' physiological responses to two different performances of Arcadelt's Il bianco e dolce cigno"
12:00-14:00	LUNCH	
Fr-PM [top]	CROSS-CULTURAL EFFECTS	NEUROSCIENCE
14:00-14:20	Shantala Hegde, Bhargavi Ramanujam & Arya Panikar, "Role of ragas of Hindustani classical music and tempo on appraisal of happy & sad emotion: A developmental study"	Sibylle C. Herholz, Andrea R. Halpern & Robert J. Zatorre, "Individual differences in neuronal correlates of imagined and perceived tunes"
14:20-14:40	George Athanasopoulos, Nikki Moran, & Simon Frith, "Literacy makes a difference: a cross-cultural study on the graphic representation of music by communities in the United Kingdom, Japan and Papua New Guinea"	S. V. Norman-Haignere, J. H. McDermott, E. Fedorenko & N. Kanwisher, "Cortical Regions Specialized for Music"
14:40-15:00	Beste Kalender, Sandra E. Trehub & E. Glenn Schellenberg, "Cross-cultural differences in meter perception"	Aline Moussard, Emmanuel Bigand, & Isabelle Peretz, "Music as an aid to learn new verbal information in Alzheimer's disease"
15:00-15:20	Christine Beckett, "Auditory structural parsing of Irish jigs: The role of listener experience"	Blake E. Butler & Laurel J. Trainor, "Examining the role of training and movement on rhythm perception in disc jockeys using EEG and behavioural thresholds"
15:20-15:40	Naresh N. Vempala & Frank A. Russo, "How Does Culture Affect Perception of Rhythm?"	John R. Iversen, Aniruddh D. Patel, "Neural dynamics of beat perception"
15:40-16:00	BREAK	
16:00-18:00	POSTER SESSION 1	
18:00	EAST END FESTIVAL	

Saturday, August 13

Sat-AM-I [top]	RHYTHM 1	COGNITION 1	METATHEORETICAL APPROACHES
9:00-9:20	Fiona Manning & Michael Schutz, "Tapping to hear: How 'moving to the beat' improves rhythmic sensitivity"	Adena Schachner & Susan Carey, "Spontaneous goal inference without concrete external goals: Implications for the concept of dance"	Eugene Narmour, "The Past and Future of Music Cognition, Cognitive Music Theory, and Music Theory"
9:20-9:40	J. Devin McAuley, Molly J. Henry, Prashanth Rajarajan, & Karli Nave, "Effect of movement on the metrical interpretation of ambiguous rhythms: Phillips-Silver and Trainor (2007) revisited."	Dominique T. Vuvan & Mark A. Schmuckler, "Linking Perception to Cognition in the Statistical Learning of Tonal Hierarchies"	Anna K. Tirovolas & Daniel J. Levitin, "26 Years of Music Perception: Trends in the field"
9:40-10:00	Emily Cogsdill & Justin London, "The Effect of Melodic Structure and Event Density on Perceived Tempo"	Sabrina Koreimann & Oliver Vitouch, "Inattentional Deafness in Music: The Role of Expertise and Familiarity"	Daphne Tan, "Past and present conceptions of music in the mind: An introduction to Ernst Kurth's "Musikpsychologie" (1931)"
10:00-10:20	Eve Poudrier & Bruno H. Repp, "Can Musicians Track Two Different Beats Simultaneously?"	Kathleen Houlihan & Daniel J. Levitin, "Recognition of melodies from rhythm and pitch"	Eugene Narmour, "Toward a Unified Theory of Music Cognition"
10:20-10:40	BREAK		
Sat-AM-II [top]	RHYTHM 2	TONALITY AND MELODY	COMPUTATIONAL MODELING
10:40-11:00	Aaron Albin, Sang Won Lee & Parag Chordia, "Visual Anticipation Aids in Synchronization Tasks"	David Sears, William E. Caplin, & Stephen McAdams, "The Perception of Cadential Closure in Mozart's Keyboard Sonatas"	David Temperley, "A Bayesian Theory of Musical Pleasure"
11:00-11:20	Mark Riggle, "Explaining the Snowball dance effect: a simpler alternative to the vocal-learning hypothesis"	Jenine Brown, "Using a Probe-Interval Methodology to Understand Listeners' Perceptions of Twelve-Tone Melodies"	David Temperley & Trevor de Clercq, "Key-finding algorithms for popular music"
11:20-11:40	Justin London & Emily Cogsdill, "Movement Rate Affects Tempo Judgments for Some Listeners"	Richard Parncutt, "Pitch salience in tonal contexts and asymmetry of perceived key movement"	Edward Large & Felix Almonte, "Neurodynamics and Learning in Musical Tonality"
11:40-12:00	Paolo Ammirante & William Forde Thompson, "Continuation tapping with triggered tones: Ideomotor effects of melodic motion on timing and movement velocity"	Mikaela Miller, Jonathan Wild, & Stephen McAdams, "Ancient Music and Modern Ears: The Perception and Discrimination of Nicola Vicentino's 31-Tone Tuning System"	Panayotis Mavromatis, "Exploring Melodic Formulaic Structure Using a Convolutional Neural Network Architecture"
12:00-	BUSINESS MEETING		

13:00			
13:00-14:00	LUNCH		
Sat-PM [top]	EMOTION 2	COGNITION 2	MUSIC AND LANGUAGE
14:00-14:20	Elizabeth Hellmuth Margulis, "Repetition as a Factor in Aesthetic Preference"	Matthew Rosenthal, Rikka Quam, & Erin Hannon, "The role of metrical structure in the acquisition of tonal knowledge"	Alice Asako Matsumoto & Caroline Marcum, "The Relationship Between Music Aptitude and the Ability to Discriminate Tone Contours in the Cantonese Language"
14:20-14:40	Joseph Plazak, "Encoding and decoding sarcasm and sincerity in instrumental music: a comparative study"	Ric Ashley, "Memory for musical sequences beyond pitch: Grammatical and Associative processes"	Fang Liu, Cunmei Jiang, William Forde Thompson, Yi Xu, Yufang Yang, & Lauren Stewart, "Why does congenital amusia only affect speech processing in minor ways? Evidence from a group of Chinese amusics"
14:40-15:00	David Huron and Katelyn Horn, "The Serious Minor Mode: A Longitudinal-Affective Study"	Sarah C. Creel, "More than meets the ear: memory for melodies includes the meter"	Nicholas Temperley & David Temperley, "Music-Language Correlations and the "Scotch Snap""
15:00-15:20	Parag Chordia & Avinash Sastry, "The Effect of Pitch Exposure on Sadness and Happiness Judgments: further evidence for 'lower-than-normal' is sadder, and 'higher-than-normal' is happier"	Panayotis Mavromatis & Morwaread Farbood, "The Effect of Scale-Degree Qualia on Short-Term Memory for Pitch"	A. Good, J. Sullivan, & F. A. Russo, "A comparison of speech vs. singing in foreign vocabulary development"
15:20-15:40	William Forde Thompson, Manuela Marin & Lauren Stewart, "Reduced sensitivity to emotional prosody in a group of individuals with congenital amusia"	Benjamin Anderson, Benjamin Duane & Richard Ashley, "The Verse-Chorus Question: How quickly and why do we know verses from choruses in popular music?"	Katie Cox, "Playing in a Dialect: a Comparison of English and American Vowels and Trombone Timbres"
15:40-16:00	BREAK		
16:00-17:30	POSTER SESSION II		
17:45-18:45	LECTURE-RECITAL: Randall Harlow, "Acoustics and psychohaptics in a pipe organ reconstruction: Eastman's Craighead-Saunders Organ"		
19:00	BANQUET		

Sunday, August 14

Sun-AM-I	EMOTION 3	PERFORMANCE 1

[top]		
9:00-9:20	Hauke Egermann, Marcus Pearce, Geraint Wiggins & Stephen McAdams, "Expectation and Emotion in a Live Concert Experiment"	Roger Chaffin, Alexander Demos, Tania Lisboa, Kristen T. Begosh, "The development of interpretation during practice and public performance: A case study"
9:20-9:40	TALK CANCELED	Rachel M. Brown & Caroline Palmer, "Effects of motor learning on auditory memory for music"
9:40-10:00	Josh Albrecht, David Huron, & Shannon Morrow, "Affective Analysis Using the Progressive Exposure Method: The second movement of Beethoven's Pathetique sonata (Op. 13)"	Austin Gross, "Measuring Cognitive Thrift in the Improvisational Technique of Bill Evans"
10:00-10:20	F.A. Russo & G.M. Sandstrom, "A new scale to identify individuals with strong emotional responses to music: Absorption in Music Scale (AIMS)"	Johanna Devaney, Jonathan Wild, Peter Schubert, & Ichiro Fujinaga, "Why can't singers sing in tune?"
10:20-10:40	BREAK	
Sun-AM-II [top]	ANALYTICAL APPROACHES	PERFORMANCE 2
10:40-11:00	Andrew Aziz, "Debussy's 'Hommage a Haydn,' Ravel's 'Menuet sur le nom d'Haydn,' and the Probabilistic Key-Finding Model"	Jonathan Kruger, James McLean & Mark Kruger, "Impact of musical demands on measures of effort and tension during trumpet performance"
11:00-11:20	Yingjia Liu, Sisi Sun & Parag Chordia, "Pitch-continuity based music segmentation"	Meagan E. Curtis, Shantala Hegde & Jamshed J. Bharucha, "Musical Improvisation in Indian and Western Singers"
11:20-11:40	Andie Sigler & Eliot Handelman, "The dynamic implications of simple and recursive patterns in music"	Matthew Poon & Michael Schutz, "The Emotional Piano: Exploring the use of pitch height and articulation rate in major and minor keys"
11:40-12:00	Art Samplaski, "Some New Data, Suggestions, and Implications on Key-Finding as a Cognitive Task"	Peter Q. Pfordresher, Alex Tilton, James T. Mantell, & Steven Brown, "Singing with yourself: Assessing the influence of self-similarity and prototypicality in vocal imitation"

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