

UNIVERSITY OF OXFORD
FACULTY OF MUSIC



UNIVERSITY OF JYVÄSKYLÄ
DEPARTMENT OF MUSIC



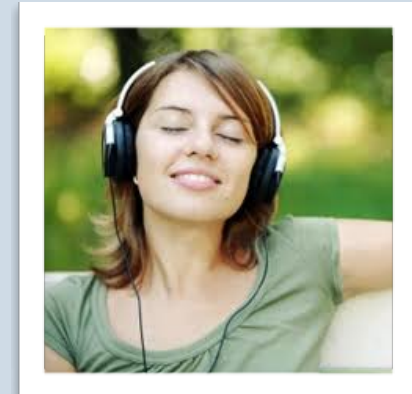
Psychological perspectives on music- induced emotion: **The intriguing case of sad music**

Dr. Jonna Vuoskoski

jonna.vuoskoski@music.ox.ac.uk

Music & emotion?

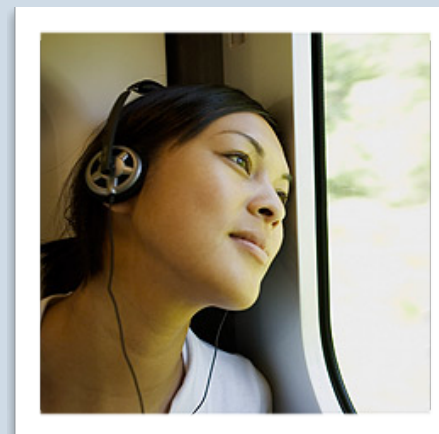
- ▶ A broad area of research involving a variety of phenomena, perspectives, and methods



- ▶ Most research has focused on the listener's perspective

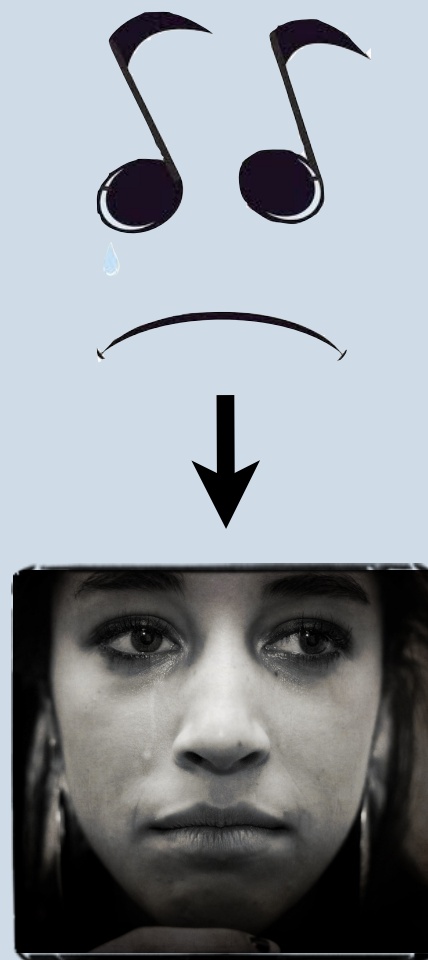
Music-induced emotions in everyday life

- ▶ Music is present 37-41% of our waking time (Juslin et al. 2008; Sloboda et al. 2001)
- ▶ Music evokes emotions in us 55-64% of the time we spend listening to it (Juslin & Laukka 2004; Juslin et al. 2008)
- ▶ People use music listening for emotional functions
 - ▶ Relaxation, lifting up spirits, energising, discharging negative emotions, solace... (Saarikallio & Erkkilä, 2007)

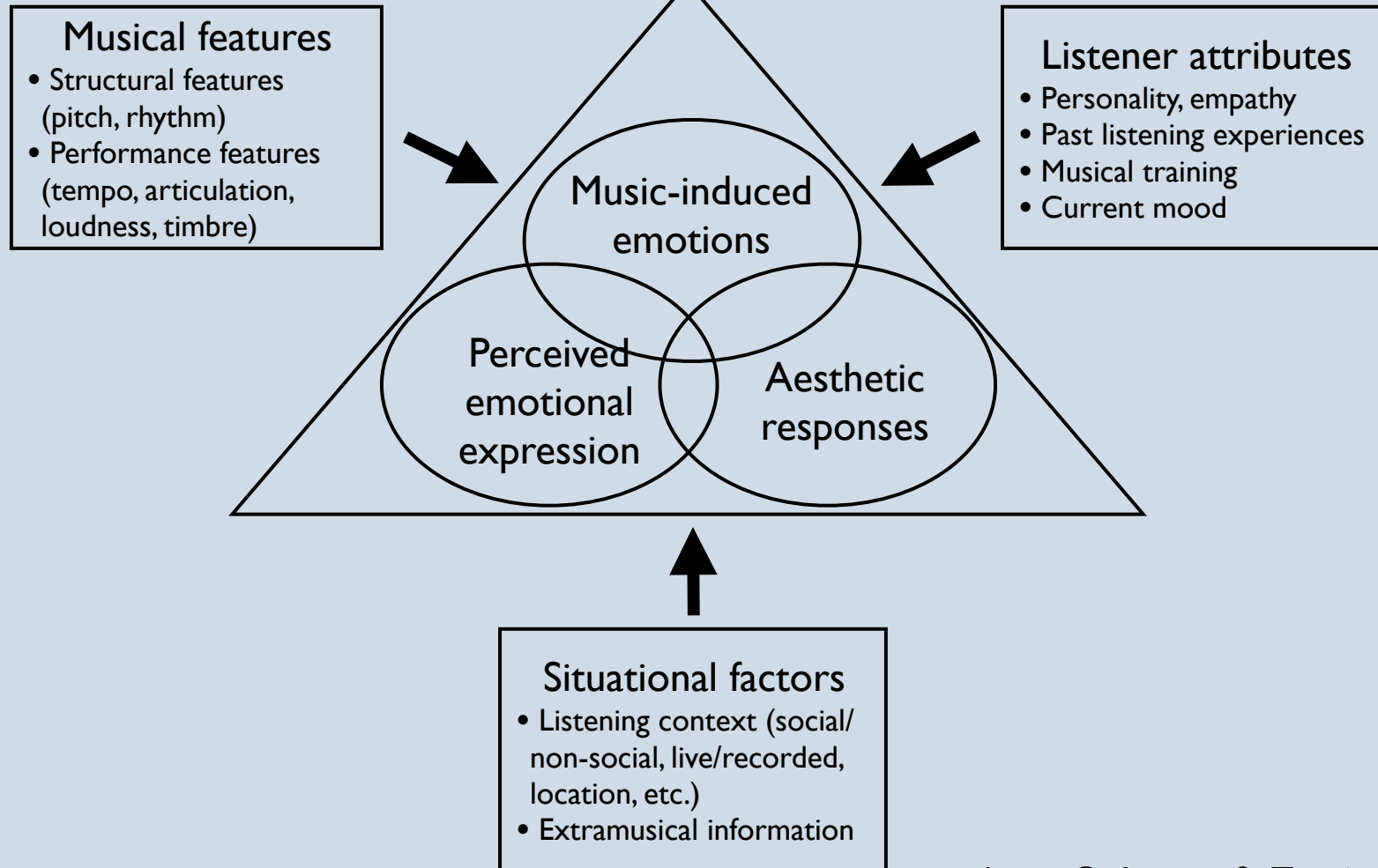


Key concepts

- **Perceived emotion** = emotion that is somehow represented, communicated, or “expressed” by music, and perceived / interpreted by the listener
- **Felt emotion** = an emotional reaction that the music induces **in** the listener
- **Preference / aesthetic response** = a liking or disliking response to a piece of music



Music-related affective phenomena



(e.g., Scherer & Zentner, 2001)

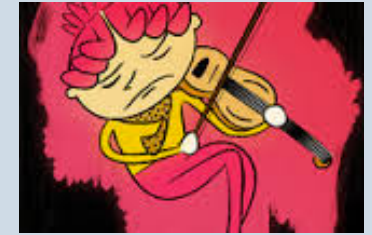
How is music able to communicate emotional meaning?

Perceived emotion



- Perceived emotional expression of music is influenced by:
 - Structural features of the music (i.e., the composition)
 - The expressive efforts of the performer (i.e., tempo, articulation, loudness)
- Some of these features are culturally learned, but: also evidence suggesting that music can effectively communicate emotions across cultures (e.g., Balkwill & Thompson, 1999; Fritz et al., 2009)

Similarities between music and other human domains



- Speech and vocal expression of emotion (Juslin & Laukka, 2003)
 - Music exploits the acoustic code for vocal expression of emotions
- Human movement & gesture
 - All sounds from traditional acoustics instruments are produced by human movement -> we can “hear” this movement in music
 - Music emulates the speed, posture, and smoothness/jerkiness of human movement and gestures (Jackendoff & Lerdahl, 2006)

Other cues

- Culturally learned cues
 - Mode (e.g., minor/major)
 - Contextual associations (e.g., wedding and funeral music)
 - Frequent pairing with narrative content (song lyrics, films, TV, opera)
 - The expression of emotion through music as a culturally constructed notion
- Human characteristics/virtual person
 - People often describe music using words that are typically used to describe people -> music creates a “virtual person”? (Watt & Ash, 1998)



How is music able to evoke emotional responses in listeners?

Perceived emotion ⇒ felt emotion?

- Emotion perception and emotion induction can take place simultaneously, but emotion perception does not always lead to felt emotion
- The border between felt and perceived emotion may be blurred, and the relationship between the two is not always straightforward (e.g., Gabrielsson, 2002)



- The relationship between perceived and felt emotion might depend on the mechanism through which an emotion is induced

Why should music induce emotional responses?



- Everyday emotions are typically driven by cognitive appraisal
 - Cognitive appraisal: An individual's assessment of the personal significance and implications of events or current circumstances
- Music does not typically have real-life implications for our goals or desires
 - Why (and how) should instrumental music – without any explicit semantic meaning – induce an emotional response in us?

How can music induce emotions?

- Mechanisms proposed by Juslin & Västfjäll (2008; see also Juslin, 2013):
 - Brain stem reflexes
 - Evaluative conditioning
 - Emotional contagion
 - Visual imagery
 - Episodic memory
 - Musical expectancy
 - Rhythmic entrainment
- Different mechanisms may be at function simultaneously, and lead to differing emotional responses (i.e., mixed emotions)

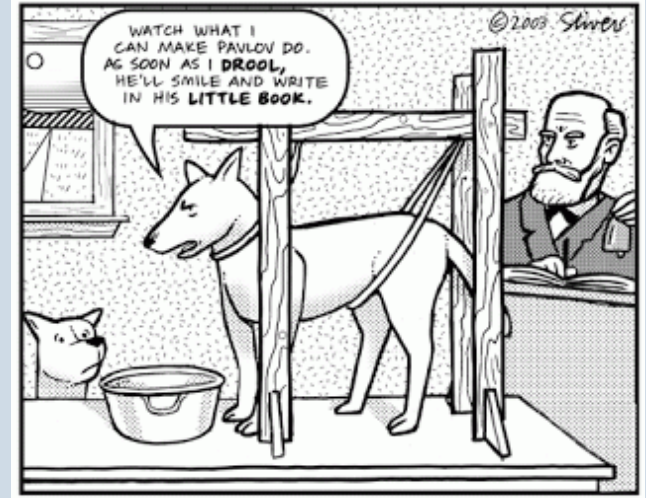
Brain stem reflexes



- One or more fundamental acoustic characteristics of the music are taken by the brain stem to signal a potentially important and urgent event that needs attention
- E.g., sounds that are sudden, loud, or dissonant, or that feature accelerating patterns
- Brain stem reflexes are quick, automatic, and unlearned
- May increase arousal and evoke feelings of surprise in the listener

Evaluative conditioning

- An emotion is induced because a piece of music has often been paired with other emotional stimuli
- Through repeated pairing, the music alone will eventually evoke the associated emotion
- Involves subconscious, unintentional, and effortless processes that can be subtly affected by musical events
 - These effects are utilised by music in marketing and advertising, Wagner's *Leitmotiv* technique, etc.



Emotional contagion



- A 'pre-conscious' or 'automatic' form of empathy
- The listener perceives the emotional expression of the music, and then 'mimics' this expression internally
 - The listener will respond to music as they would to the perceived emotional state of another human, resonating with those auditory and gestural features that resemble vocal and motor expression of emotion
- May potentially utilise mirror-neuron pathways, engaging our motor systems at a pre-conscious, perceptual level

Emotional contagion (2)



- Mirror neurons?
 - Neurons that "mirror" the behaviour/action of an observed individual, as though the observer were itself acting
 - Fire both when a person acts and when the person observes the same action performed by another
- Through a form of pre-conscious 'motor simulation' – we can 'feel' what another agent (music, in this case) is intending or experiencing (e.g., McGuiness & Overy, 2011)
- Musical sound is perceived not only in terms of the auditory signal, but also in terms of the intentional sequences of expressive motor acts behind the signal (Molnar-Szakacs et al., 2012)

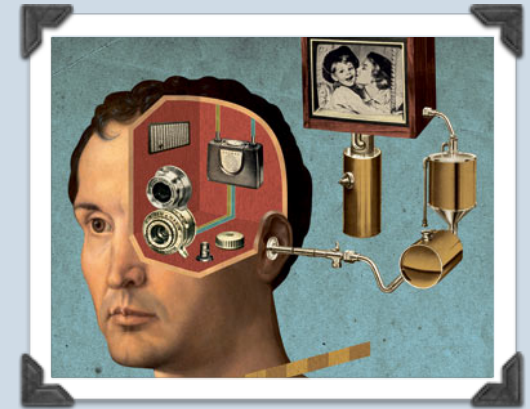
Visual imagery



- A process whereby a listener conjures up – either intentionally or unintentionally – visual images while listening to music
- Potential mechanisms underlying visual imagery:
 - A nonverbal mapping between the metaphorical ‘affordances’ of the music and ‘image-schemata’ grounded in bodily experience (Juslin & Västfjäll, 2008)
 - The frequent pairing of music with narrative content (lyrics, TV and film music) + the innate human tendency to make sense of our experiences through the construction of narratives (Lavy, 2001; see also Vuoskoski & Eerola, 2013)

Episodic memory

- The music evokes a personal memory of a specific event in the listener's life
 - Also called the 'Darling, they are playing our tune' phenomenon
- When a memory is evoked, so is the emotion associated with that memory
 - Episodic memories linked to music often arouse emotions such as nostalgia
- Familiar, self-selected music often evokes autobiographical memories and more intense emotions (Vuoskoski & Eerola, 2012)

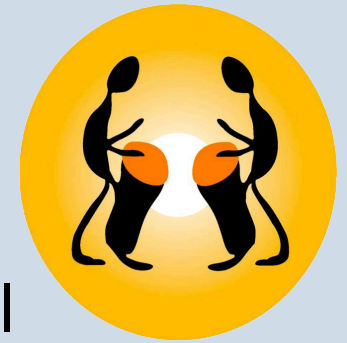


Musical expectancy



- An emotion is induced in a listener because a specific feature of the music violates, delays, or confirms the listener's expectations about the continuation of the music (e.g., Meyer, 1956)
 - The expectations are based on the listener's previous experience of the same musical style and correlate with statistical regularities
 - Diverging expectations can arise depending on how the listener conceives of the genre of the music heard
- Musical emotions induced by expectancy violations might include tension, surprise, and 'thrills'

Rhythmic entrainment



- The rhythm in the music influences some internal bodily rhythm of the listener (e.g., breathing), so that it ‘locks in’ to a common periodicity with the music
- Can increase arousal, but may also arouse feelings of communion and ‘emotional bonding’
 - Studies utilizing tapping tasks have shown that when tapping in synchrony with another, the tapping partner evokes more compassion and altruistic behaviour than when tapping asynchronously (Valdesolo & DeSteno, 2011).
- Optimally syncopated music (i.e., groove) induces a pleasurable emotional response and a strong desire to move to the music (Witek, 2013)
 - “Syncopation invites the body to physically enact the musical structure and directly participate in the rhythms of groove, due to the perceptual tension and ‘open spaces’ afforded by [...] syncopation” (Witek, 2013)



The intriguing case of sad music

Can listening to sad music really make
you sad?

- Peter Kivy (1989, p. 163): “...the members of one substantial group of listeners who report that sad music makes them sad are simply (and understandably) mistaken in their appraisals of how they really feel.”
 - Music alone cannot evoke the “garden variety” of emotions; music-related episodic memories are an exception
- What about emotional contagion / empathy (and other mechanisms proposed by Juslin & Västfjäll, 2008)?

Why should sad music make you sad?

A possible contributor: Empathy



- **Empathy** = a process by which an emotion is evoked by witnessing others' emotional reactions
- Mirror neurons provide a possible physiological mechanism for empathy (e.g., Iacobini, 2009)
- Huron (2011): acoustic features of sad music (resembling sad speech) may activate pertinent mirror neurons, and evoke an empathetic sad response

Acoustic cues of sadness

- Similarities between sad speech prosody and sad music (Huron, 2011):
 1. Low pitch
 2. Small pitch movement / small intervals
 3. Low volume
 4. Slow tempo
 5. Mumbled / legato articulation
 6. Dark timbre





An individual differences approach

- **Trait empathy** = an individual's dispositional responsiveness to the observed experiences of others
 - Linked with emotional contagion in general (Doherty, 1997)
 - Associated with heightened mirror neuron activity during the perception of speech prosody (Aziz-Zadeh et al., 2010)
 - Common brain regions activated during the production and perception of prosody → evidence for “mirror” processing of prosody
- ➔ Would those with high dispositional empathy also be more sensitive to emotional contagion from music?

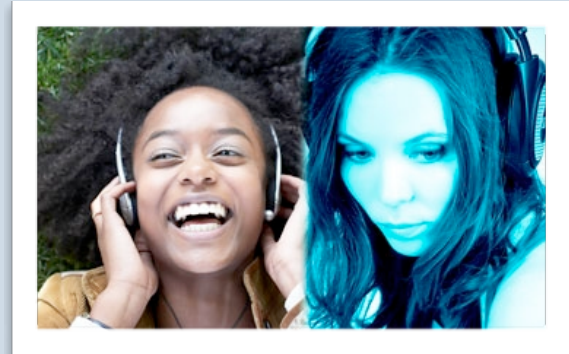
Experiment: Can sad music really make you sad? (Vuoskoski & Eerola, 2012)

- **Questions:**

- Can unfamiliar, instrumental sad music induce genuine sadness?
- Does empathy contribute to music-induced sadness?

- **Hypothesis:** those with high trait empathy are more susceptible to emotion contagion from music

Method



- 60 participants randomly assigned to 2 conditions:
 - **Group 1** listened to 8 minutes of unfamiliar, instrumental sad music
 - **Group 2** listened to 8 minutes of “neutral” music
- Trait empathy measured using the *Interpersonal Reactivity Index* (IRI; Davis, 1980)
 - Subscales: Fantasy, Perspective-taking, Empathic concern, and Personal distress

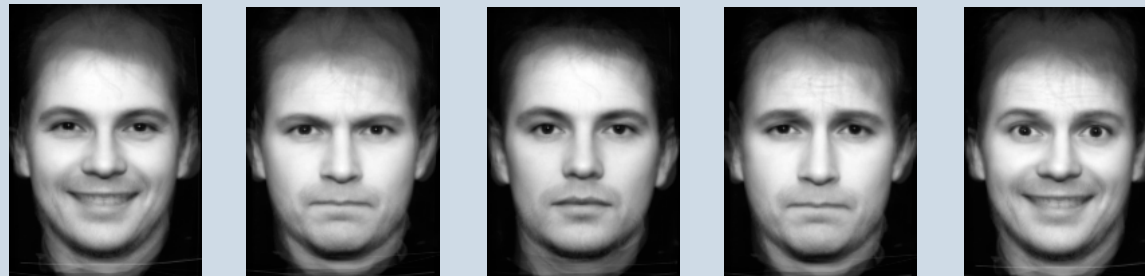
Method

- Induced emotions were measured as objectively as possible using **indirect** memory and judgment tasks

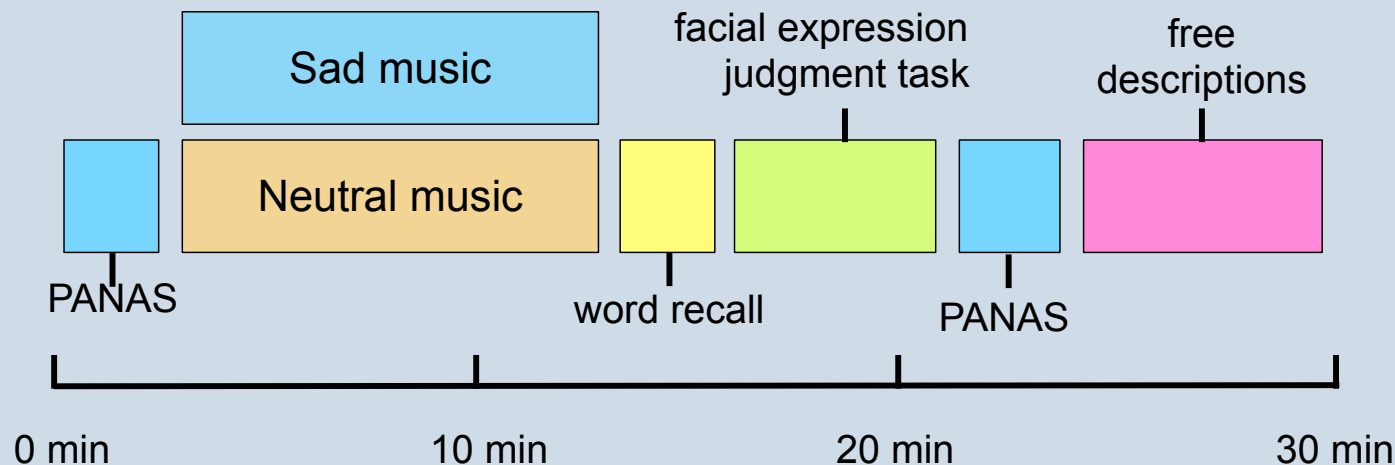
- Memory task (positive & negative adjectives):

Positive	Negative
Active	Afraid
Alert	Scared
Attentive	Nervous
Determined	Jittery
Enthusiastic	Irritable
Excited	Hostile
Inspired	Guilty
Interested	Ashamed
Proud	Upset
Strong	Distressed

- Perceived emotions in facial expressions:



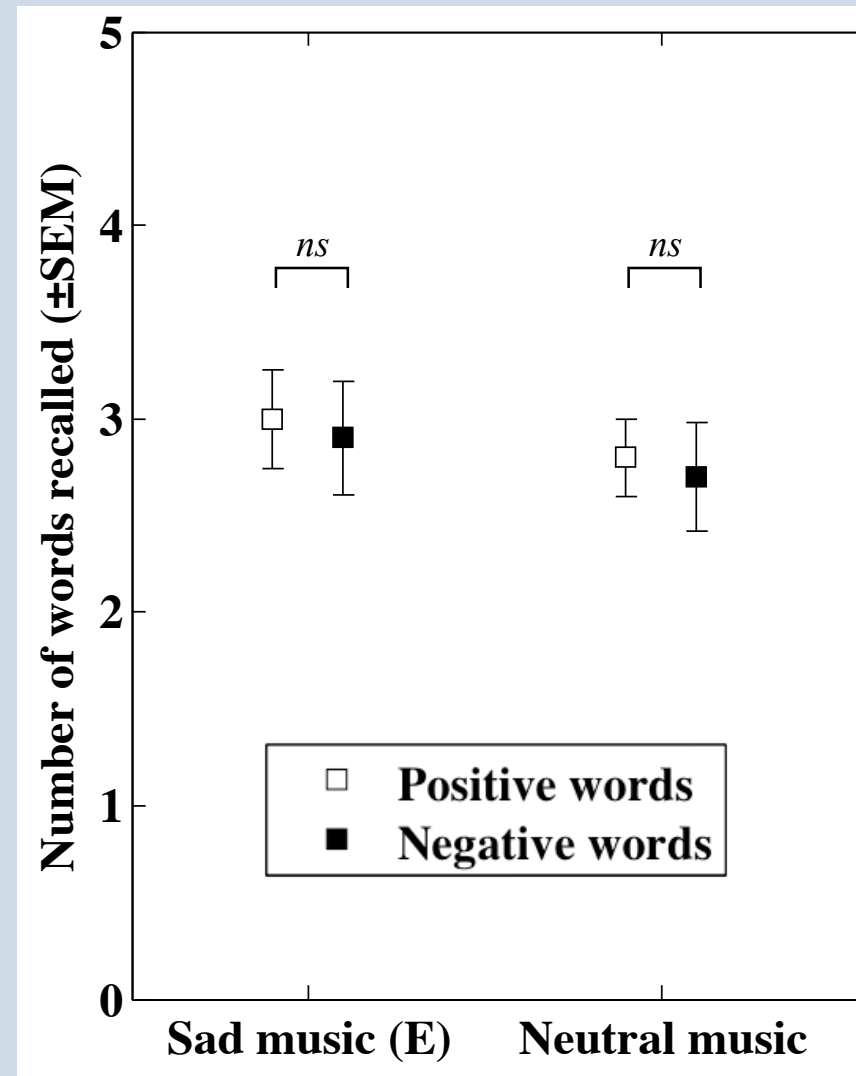
Procedure



- Pre-existing mood was measured using the Positive and Negative Affect Schedule (PANAS)
- Also free descriptions of music-evoked thoughts and impressions

Results: Word recall task

- No pre-existing mood differences between the two groups
- The results of the word recall task were inconclusive



The picture judgment task



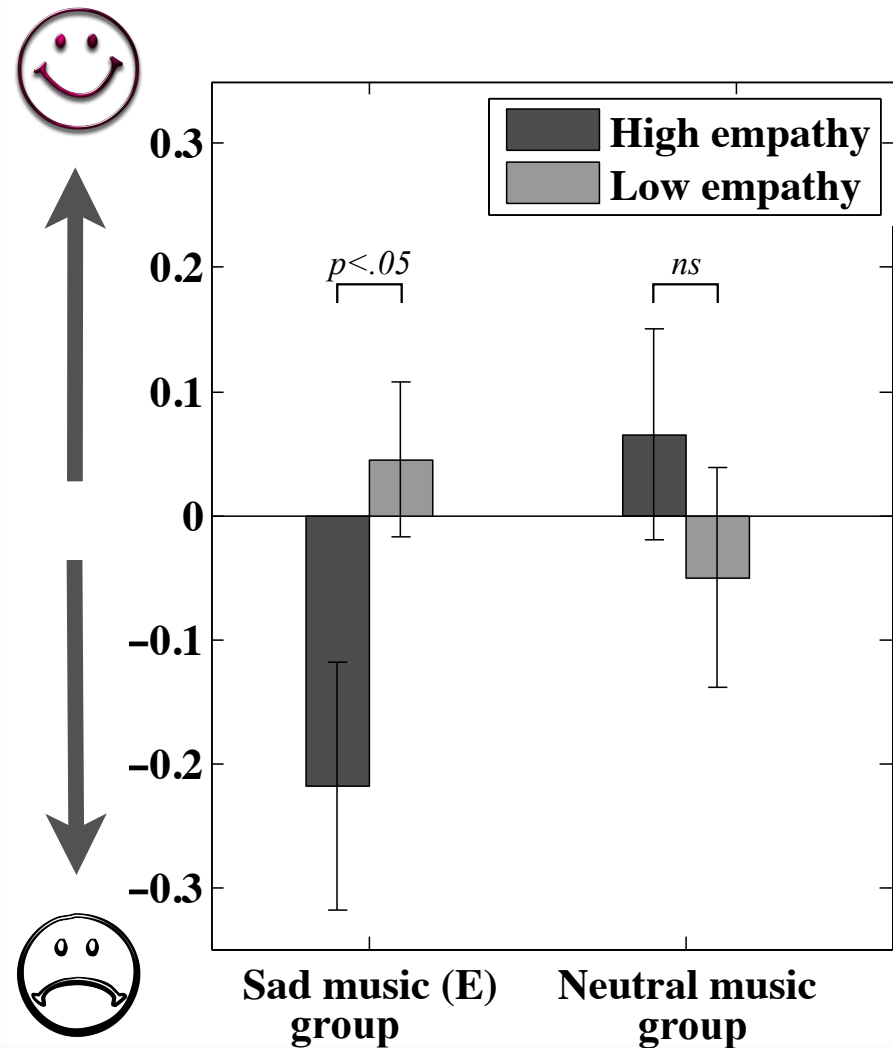
- Correlations between **trait empathy** and **mean sadness ratings** (for facial pictures):

	Sad music	Neutral music
Empathy (global)	.63***	-.08
Fantasy	.54**	-.21
Empathic concern	.48**	.25
Perspective-taking	.27	-.12
Empathic distress	.07	-.01

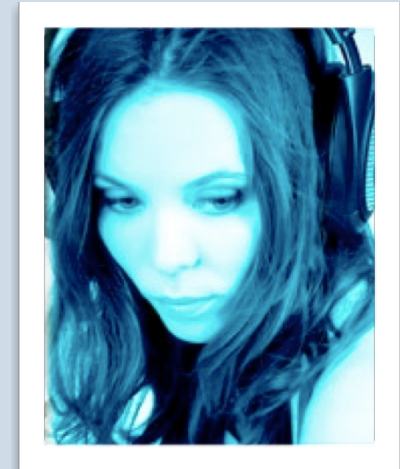
** $p < .01$, *** $p < .001$

The picture judgment task (2)

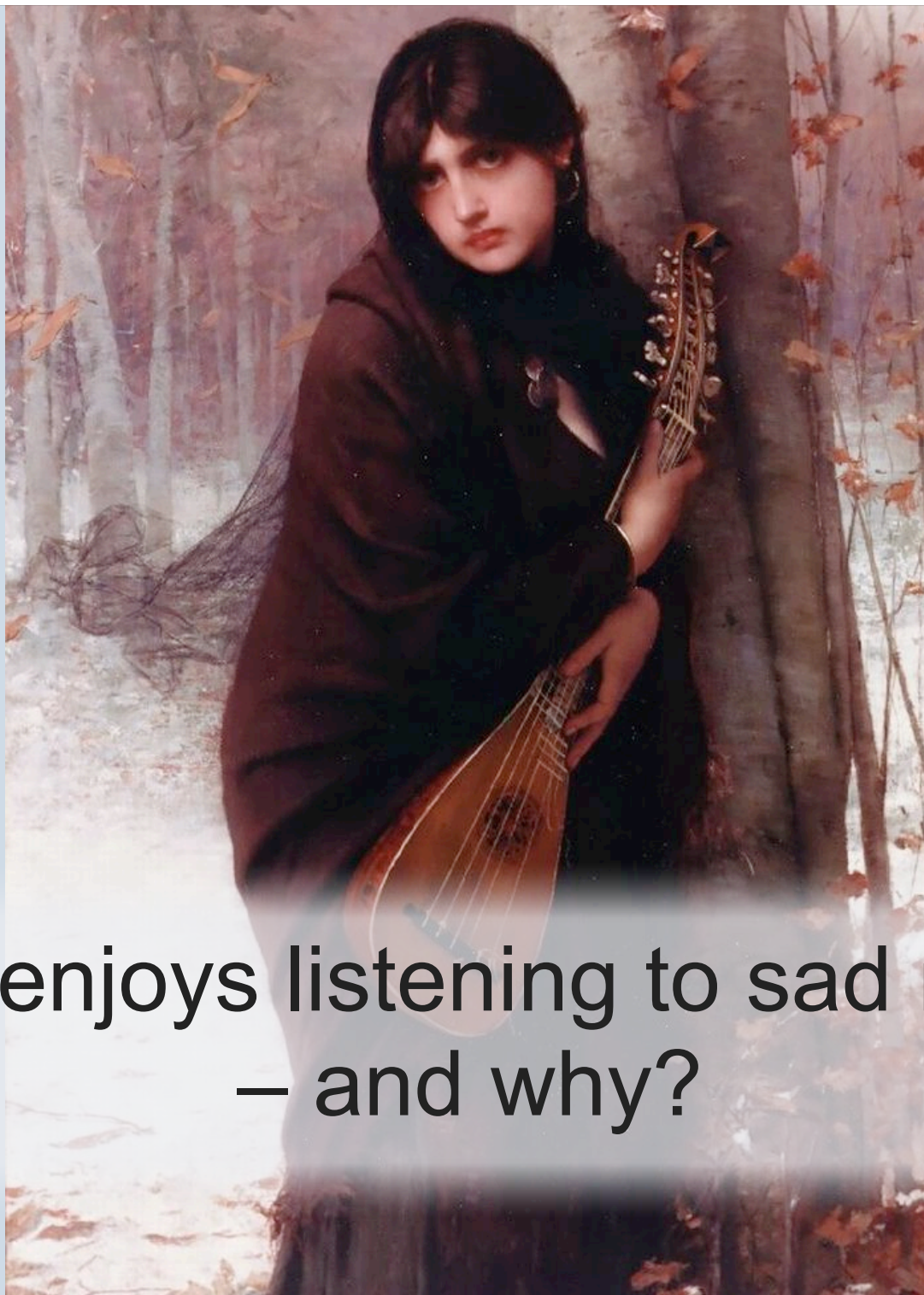
- Judgment bias on a sad–happy -continuum:
 - Empathic participants in the sad music group had a judgment bias towards sadness



Conclusions



- Trait empathy appears to be positively associated with the susceptibility to music-induced sadness
 - ➔ Support for the theories suggesting that music may induce emotional responses through empathy or emotional contagion
- Instrumental, unfamiliar music may induce genuine sadness via emotional contagion – in certain listeners



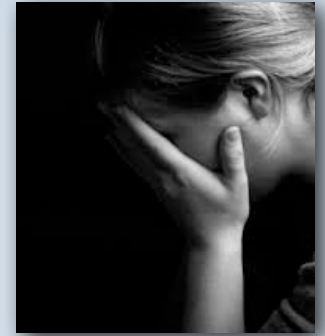
Who enjoys listening to sad music
– and why?

Why should sad music be pleasurable?

- Music-induced sadness - though a “negative” emotion - is appraised as harmless due to the aesthetic context (e.g., Schubert, 1996)
- Huron (2011): the possible contribution of the consoling hormone *prolactin*
 - Prolactin is released when experiencing sadness (also through empathy; e.g., Turner et al., 2002)
 - Prolactin shown to produce feelings of tranquility, consolation, and well-being



Sad music and mood regulation



- Sad music can be used as a therapeutic tool to cope with personal losses, and to relive memories and the related negative emotions (Van den Tol & Edwards, 2013)
- With the help of sad music, people can understand their feelings and/or solve unwanted affects through introspection (Van Goethem, 2010)
- Interpersonal and autobiographical aspects are central to people's motivations for listening to sad music (Eerola et al., in press; Van den Tol & Edwards, 2013)
 - People tend to seek out social contact when feeling sad, but sad music can serve as a surrogate for empathic social contact with a friend (Lee et al., 2013)

Why should sad music be pleasurable? (2)

- The contribution of aesthetic appreciation?
 - Perceived sadness associated with perceived beauty in music (Eerola & Vuoskoski, 2011)
 - Sad music is twice as likely to evoke ‘chills’ or ‘shivers down the spine’ as happy music (Panksepp, 1995)
 - “It is not that the sadness per se is a source of pleasure, it only happens to occur together with a percept of beauty” (Juslin, 2013, p. 24)
- Aesthetic appreciation ≠ enjoyment??

Study: The interconnections of perceived sadness, beauty, and liking (Vuoskoski & Eerola, in prep.)

- Aim: to clarify the interconnections of sadness, beauty, and liking
- 27 short film music examples where perceived sadness and beauty were varied as independently as possible (high, moderate, and low levels of both; 3 x 3 x 3)
 - Selected from a database of 419 examples
- 19 participants rated liking, perceived beauty, and perceived emotion

Results

- Although levels of sadness and beauty were varied, the two concepts were still significantly correlated; $r = .38, p < .05$.
- Liking and perceived beauty were almost identical; $r = .92, p < .001$
- Movingness was highly correlated with both sadness ($r = .76, p < .001$) and beauty ($r = .81, p < .001$)
 - “Movingness” drives the association between beauty and sadness?

Individual differences?



- Not everyone enjoys listening to sad music (e.g., Garrido & Schubert, 2011)
- Do those who enjoy listening to sad music have something else in common as well?
 - ➔ What can these commonalities tell us about the pleasure drawn from sad music?
- Previous work: Trait empathy, Absorption, and Openness to experience associated with the enjoyment of sad music (Vuoskoski et al., 2012; Garrido & Schubert, 2011)

Study: Who enjoys listening to sad music and why? (Eerola & Vuoskoski, in preparation)

- Questions:
 - What kinds of subjective emotional experiences are induced in listeners by sad music?
 - Is the tendency to enjoy sad music associated with certain background variables?

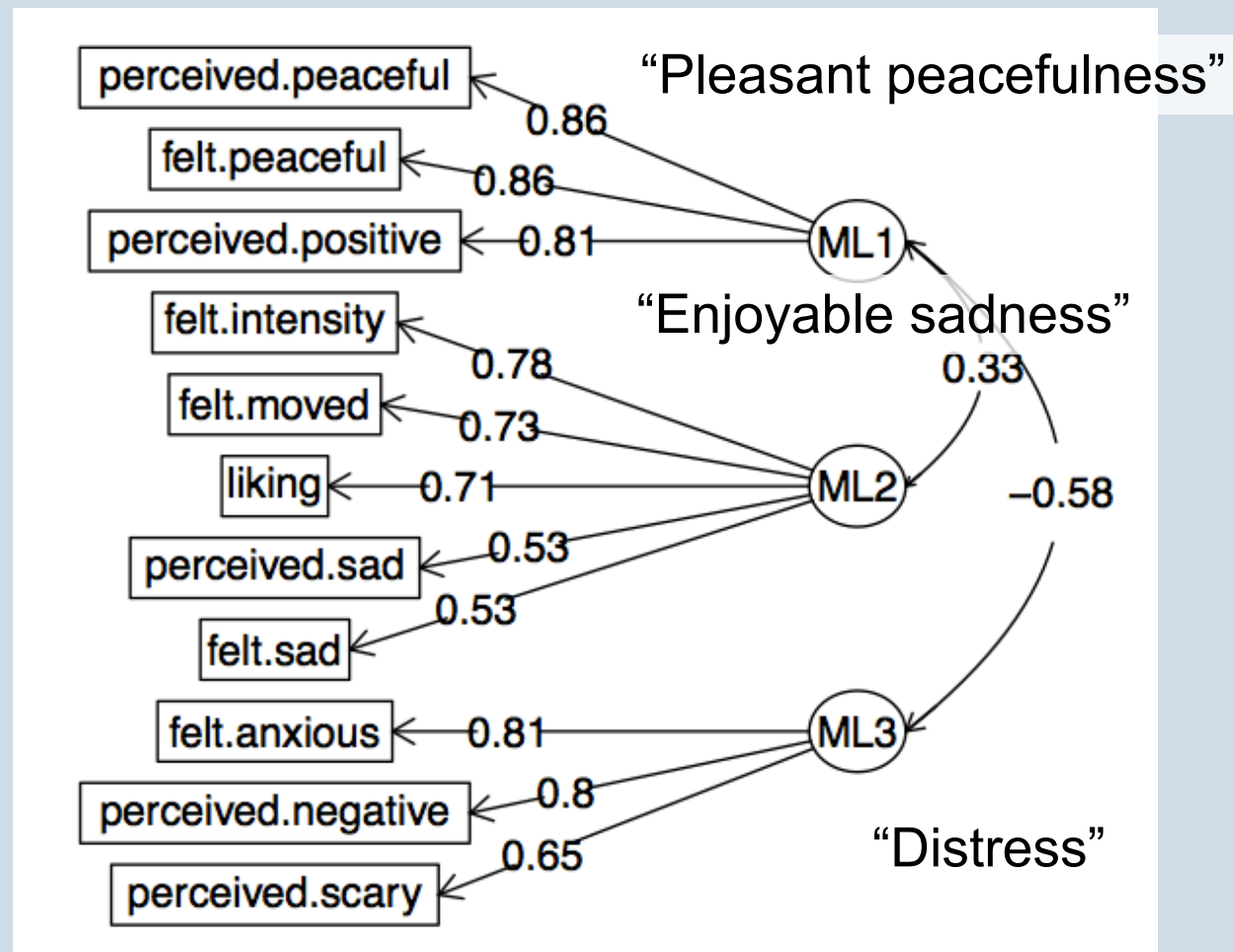
Which personality measures best predict the enjoyment of sad music?

- Absorption
- Emotional Contagion
- Trait Empathy
 - Empathic Concern
 - Fantasy
 - Personal Distress
 - Perspective-taking
- Nostalgia-proneness

Method

- Participants: 102 Finnish adults aged 20-67
- Experiment:
 - Participants listened to 8 minutes of unfamiliar, instrumental sad music
 - Ratings of perceived emotion, felt emotion, and liking
 - Personality measures: Trait empathy, Emotional contagion, Absorption, Nostalgia (+ general health and quality of life measures)

Structure of emotional responses to sad music



Principal Component Analysis with Oblimin rotation;
75.8% variance explained

Which personality measures best predict “Enjoyable sadness”?

- Absorption
- Emotional Contagion
- Trait Empathy
 - Empathic Concern
 - Fantasy
 - Personal Distress
 - Perspective-taking
- Nostalgia

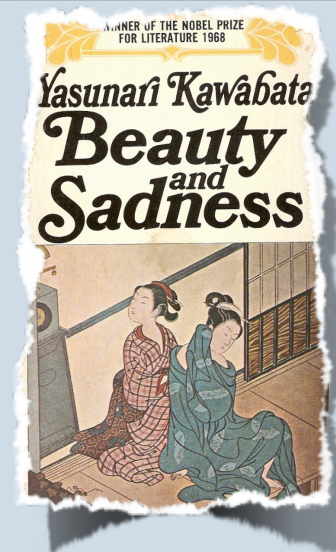
Which personality measures best predict “Enjoyable sadness”?

- Absorption
- Emotional Contagion
- (Trait Empathy)
 - Empathic Concern
 - Fantasy
 - Personal Distress
 - Perspective-taking
- Nostalgia

$$R^2 = .22$$

(22% of variance between individuals explained)

Conclusions



- Subjective responses to sad music can be reduced to 3 factors; 'Pleasant peacefulness', 'Enjoyable sadness', and 'Distress'
- 'Enjoyable sadness' was significantly predicted by trait empathy measures (Emotional Contagion & Fantasy)
 - Trait empathy also associated with the intensity of music-induced sadness -> a link between empathically experienced sadness and enjoyment?
 - Empathic people may find it intrinsically pleasurable to engage in empathic sadness in aesthetic contexts

A large, detailed photograph of the dome of St Paul's Cathedral in London, featuring its iconic silver-colored lead cladding and classical architectural elements like columns and balustrades. The sky is blue with light clouds.

Thank you!

Special thanks:

Prof. Tuomas Eerola
Durham University, UK
University of Jyväskylä, Finland



References (1/3)

- Aziz-Zadeh, L., Sheng, T., & Gheytaichi A. (2010) Common premotor regions for the perception and production of prosody and correlations with empathy and prosodic ability. *PLoS ONE*, 5, e8759. doi:10.1371/journal.pone.0008759
- Balkwill, L-L. & Thompson, W. F. (1999). A cross-cultural investigation of the perception of emotion in music: psychophysical and cultural cues. *Music Perception*, 17, 43–64.
- Davis, M. H. (1980). A multidimensional approach to individual differences in empathy. *JSAS Catalog of Selected Documents in Psychology*, 10, 85.
- Doherty, R. W. (1997). The emotional contagion scale: A measure of individual differences. *Journal of Nonverbal Behavior*, 21, 131–154.
- Eerola, T., & Vuoskoski, J. K. (2011). A comparison of the discrete and dimensional models of emotion in music. *Psychology of Music*, 39, 18-49.
- Fritz, T., Jentscke, S., Gosselin, N., Sammler, D., Peretz, I., Turner, R., Friederici, A. D. & Koelsch, S. (2009). Universal recognition of three basic emotions in music. *Current Biology* 19, 573–576.
- Gabrielsson, A. (2002). Emotion perceived and emotion felt: Same or different?. *Musicae Scientiae*, 5(1 suppl), 123-147.
- Gabrielsson, A. (2009). The relationship between musical structure and perceived expression. In Hallam, S., Cross, I. & Thaut, M. (eds.), *The Oxford 52 Handbook of Music Psychology* (pp. 141-150). Oxford: Oxford University Press.
- Garrido, S. & Schubert, E. (2011). Individual differences in the enjoyment of negative emotion in music: A literature review and experiment. *Music Perception*, 28, 279-296.
- Huron, D. (2011). Why is sad music pleasurable? A possible role of prolactin. *Musicae Scientiae*, 15, 146-158.
- Iacobini, M. (2009). Imitation, empathy, and mirror neurons. *Annual Reviews of Psychology*, 60, 653-70.
- Jackendoff, R., & Lerdahl, F. (2006). The capacity for music: What is it, and what's special about it?. *Cognition*, 100(1), 33-72.
- Juslin, P. N. (2013). From everyday emotions to aesthetic emotions: Towards a unified theory of musical emotions. *Physics of life reviews*, 10(3), 235-266.
- Juslin, P. N., & Laukka, P. (2003). Communication of emotions in vocal expression and music performance: Different channels, same code?. *Psychological Bulletin*, 129(5), 770.
- Juslin, P. N. & Laukka, P. (2004). Expression, perception, and induction of musical emotions: A review and a questionnaire study of everyday listening. *Journal of New Music Research*, 33, 217–238.
- Juslin, P. N., Liljeström, S., Västfjäll, D., Barradas, G. & Silva, A. (2008). An experience sampling study of emotional reactions to music: Listener, music, and situation. *Emotion*, 8, 668–683.

References (2/3)

- Juslin, P. N., Liljeström, S., Västfjäll, D. & Lundqvist, L.-O. (2010). How does music induce emotions? Exploring the underlying mechanisms. In P. N. Juslin, & J. A. Sloboda (eds.), *Handbook of Music and Emotion: Theory, Research, Applications* (pp. 605-642). Oxford: Oxford University Press.
- Juslin, P. N. & Västfjäll, D. (2008). Emotional responses to music: The need to consider underlying mechanisms. *Behavioral and Brain Sciences*, 31, 559-575.
- Kivy, P. (1989). *Sound Sentiment: An Essay on the Musical Emotions, Including the Complete Text of The Corded Shell*. Philadelphia: Temple University Press.
- Koelsch, S., Siebel, W. A., & Fritz, T. (2010). Functional neuroimaging. In Juslin, P. N. & Sloboda, J. A. (eds.), *Handbook of Music and Emotion: Theory, Research, Applications* (pp. 313-344). Oxford: Oxford University Press.
- Lavy, M. M. (2001). *Emotion and the Experience of Listening to Music: A Framework for Empirical Research*. Unpublished doctoral dissertation, University of Cambridge.
- Lee, C. J., Andrade, E. B., & Palmer, S. E. (2013). Interpersonal relationships and preferences for mood-congruency in aesthetic experiences. *Journal of Consumer Research*, 40(2), 382-391.
- Livingstone, S. R. & Thompson, W. F. (2009). The emergence of music from the Theory of Mind. *Musicae Scientiae*, special issue 2009-2010, 83-115.
- McGuiness, A., & Overy, K. (2011). Music, consciousness, and the brain: music as shared experience of an embodied present. In Clarke, D. & Clarke, C. (Eds.), *Music and Consciousness: Philosophical, Psychological, and Cultural Perspectives* (pp. 245- 262). Oxford: Oxford University Press.
- Meyer, L. B. (1956). *Emotion and meaning in music*. Chicago: The University of Chicago Press.
- Molnar-Szakacs, I., Assuied, V. G. & Overy, K. (2012) Shared Affective Motion Experience (SAME) and creative, interactive music therapy. In *Musical imaginations: Multidisciplinary perspectives on creativity, performance, and perception*, pp. 313-331 Oxford: Oxford University Press
- Panksepp, J. (1995). The emotional sources of "chills" induced by music. *Music Perception*, 13(2), 171-207.
- Polkinghorne, D. (1988). *Narrative Knowing and the Human Sciences*. Albany, NY: State University of New York Press.
- Preston, S. D., & de Waal, F. B. M. (2002). Empathy: Its ultimate and proximate bases. *Behavioral and Brain Sciences*, 25, 1-72.
- Saarikallio, S., & Erkkilä, J. (2007). The role of music in adolescents' mood regulation. *Psychology of Music*, 35(1), 88-109.

References (3/3)

- Scherer, K. R. & Zentner, M. R. (2001). Emotional effects of music: Production rules. In Juslin, P. N. & Sloboda, J. A. (Eds.), *Music and emotion: Theory and research* (pp. 361-392). Oxford: Oxford University Press.
- Schubert, E. (1996). Enjoyment of negative emotions in music: An associative network explanation. *Psychology of Music*, 24(1): 18–28.
- Sloboda, J. A., O'Neill, S.A. & Ivaldi, A. (2001). Functions of music in everyday life: An exploratory study using the Experience Sampling Method. *Musicae Scientiae*, 5, 9-32.
- Turner, R. A., Altemus, M., Yip, D. N., Kupferman, E., Fletcher, D., Bostrom, A., ... & Amico, J. A. (2002). Effects of emotion on oxytocin, prolactin, and ACTH in women. *Stress: The International Journal on the Biology of Stress*, 5(4), 269-276.
- Valdesolo, P., & DeSteno, D. (2011). Synchrony and the social tuning of compassion. *Emotion*, 11(2), 262.
- Van den Tol, A. J. M., & Edwards, J. (2013). Exploring a rationale for choosing to listen to sad music when feeling sad. *Psychology of Music*, 41(4), 440–465.
- van Goethem, A. (2010). Affect regulation in everyday life: Strategies, tactics, and the role of music. (Doctoral dissertation). Keele University, UK.
- Vuoskoski, J. K., & Eerola, T. (2012). Can sad music really make you sad? Indirect measures of affective states induced by music and autobiographical memories. *Psychology of Aesthetics, Creativity, and the Arts*, 6, 204-213.
- Vuoskoski, J. K. & Eerola, T. (2013). Extramusical information contributes to emotions induced by music. *Psychology of Music*. DOI: 10.1177/0305735613502373.
- Vuoskoski, J. K., Thompson, W. F., McIlwain, D., & Eerola, T. (2012). Who enjoys listening to sad music and why? *Music Perception*, 29, 311-317.
- Watt, R. J., & Ash, R. L. (1998). A psychological investigation of meaning in music. *Musicae Scientiae*, 2(1), 33-53.
- Witek, M. (2013). '... and I feel good!': the relationship between body-movement, pleasure and groove in music (Doctoral dissertation, University of Oxford).
- Zentner, M. R., Grandjean, D. & Scherer, K. R. (2008). Emotions evoked by the sound of music: Characterization, classification, and measurement. *Emotion*, 8, 494-521.