

# Emotional Expression in Speech and Music

## Evidence of Cross-Modal Similarities

PATRIK N. JUSLIN AND PETRI LAUKKA

*Department of Psychology, Uppsala University, SE-751 42 Uppsala, Sweden*

**KEYWORDS: emotion; expression; speech; music performance; nonverbal communication**

Questions about music and emotions have occupied humans since antiquity.<sup>1</sup> However, scientific progress in the area has been slowed by a reluctance to adopt evolutionary approaches. Music is typically regarded as a cultural artifact. Yet, music performance is, like other forms of human behavior, constrained by evolved mechanisms. What would an evolutionary approach to music entail? In Darwin's pioneering work<sup>2</sup> we find some preliminaries for such an approach. Darwin recognized that music has the power to induce strong emotions (p. 216), as is evident from such behaviors as crying. He also noted that music often produces "a peculiar effect...the thrill or slight shiver which runs down the backbone and limbs of many persons when they are powerfully affected by music." This phenomenon has been the focus of much interest in modern research.<sup>3</sup> The most original aspect of Darwin's thinking was the idea that music originally served to attract sexual partners, a notion that has recently been revived.<sup>4</sup> However, this sexual selection theory of the origins of music is controversial, because of weak empirical support.

More fruitful, perhaps, are Darwin's suggestions regarding the relationship between speech and music. Darwin hypothesized that our human ancestors "uttered musical tones before they had acquired the power of articulate speech" (p. 92). Moreover, he noted that "when the voice is used under any strong emotion, it tends to assume...a musical character" (ibid). Like Herbert Spencer,<sup>5</sup> Darwin was inclined to explain the origins of vocal expression (i.e.,

Address for correspondence: Patrik N. Juslin, Department of Psychology, Uppsala University, Box 1225, SE-751 42 Uppsala, Sweden.  
Patrik.Juslin@psyk.uu.se

**Ann. N.Y. Acad. Sci. 1000: 279–282 (2003). © 2003 New York Academy of Sciences.  
doi: 10.1196/annals.1280.025**

the nonverbal aspects of speech) in terms of physiological principles: emotions influence physiological processes, which, in turn, influence the acoustic characteristics of speech and singing (though Darwin was slightly reluctant to apply the idea to music). Following Darwin, many theorists have speculated about a close relationship between vocal expression of emotions and musical expression of emotions,<sup>6</sup> but evidence bearing on this relationship has been lacking. The purpose of the present study is to review studies in both domains in order to examine whether the two communication channels really express emotions in similar ways.<sup>7</sup>

We adopted an evolutionary perspective in this review, according to which musicians are able to communicate specific emotions to listeners by using a nonverbal code that derives from vocal expression of emotions. We hypothesized that vocal expression is an evolved mechanism<sup>8</sup> based upon innate and universal affect programs<sup>9</sup> that develop early and are fine-tuned by prenatal experiences. On the basis of this approach, we predicted that:

- (a) communication of emotions is cross-culturally accurate in vocal expression and music performance,
- (b) the ability to decode basic emotions develops early in ontogeny, and
- (c) similar patterns of emotion-specific acoustic cues are used to communicate emotions in both communication channels.

We used two criteria for inclusion of studies in the review. First, we included only studies of nonverbal aspects of speech or specific performances of pieces of music. Second, we included only studies that investigated the communication of discrete emotions. The studies included were gathered using the internet-based scientific databases PsychINFO, Medline, LLBA, Ingenta, and RILM Abstracts of Music Literature. All together, 104 studies of vocal expression and 41 studies of music performance were located in the literature search. The results were reviewed in terms of five general categories of emotion (i.e., anger, fear, happiness, sadness, and tenderness), because these were the only five emotions for which there was enough evidence in both vocal expression and music performance.

The main findings can be summarized as follows. First, a meta-analysis of communication accuracy indicated that communication of emotions may reach an accuracy well above chance in both vocal and musical expression (mean  $P_c = 0.70$  in a forced-choice task with five emotions), at least for basic emotions. Such high accuracy has been found even in studies that did not pre-select effective stimuli.<sup>10</sup> Second, vocal expression of emotions is cross-culturally accurate, although the accuracy is somewhat lower than for within-cultural vocal expression (we lack cross-cultural data for music). Third, the ability to decode emotion from vocal and musical expression develops in early childhood (at the latest). Fourth, music performance involves mainly the same emotion-specific patterns of acoustic cues as does vocal expression. The cue-patterns are consistent with Scherer's predictions, which presume a correspondence between emotion-specific physiological changes and voice

production.<sup>11</sup> Finally, the review indicated some gaps in the literature that need to be filled by further research (e.g., with regard to the measurement of certain cues).

There is currently a debate about whether vocal expression of emotions involves discrete categories and emotion-specific patterns of acoustic cues, or only emotion dimensions such as arousal and valence.<sup>12</sup> Earlier reviews, featuring a smaller selection of studies, have left this question open. This is the most extensive review of vocal expression of emotions to date, and it provides strong evidence of emotion-specific patterns of acoustic cues in vocal expression—not only for those studies that use emotion portrayals. This, along with the fact that communication of basic emotions is cross-culturally accurate, strongly supports a discrete emotions approach to vocal expression. Failure to obtain emotion-specific patterns of acoustic cues in certain previous studies can largely be explained in terms of methodological problems.<sup>7,10</sup>

The findings presented here are consistent with the evolutionary perspective on emotional expression, and support Darwin's idea of an intimate relationship between speech and music. In effect, the present results could help to explain why music is perceived as expressive of emotion. Music is expressive in part because it presents emotion-specific patterns of acoustic cues that are similar to those in vocal expression. We submit that continued cross-modal research will provide further insights about the expressive aspects of vocal expression and music performance, insights that would be difficult to obtain from studying the two domains in separation.

## ACKNOWLEDGMENTS

This is partly a summary of an previous article (see ref. 7). The research was supported by The Bank of Sweden Tercentenary Foundation through a grant to Patrik Juslin.

## REFERENCES

1. JUSLIN, P.N. & J.A. SLOBODA, Eds. 2001. *Music and Emotion: Theory and Research*. Oxford University Press. New York.
2. DARWIN, C. 1998. *The Expression of the Emotions in Man and Animals*, 3rd edit. Harper-Collins. London. (US edit.: Oxford University Press. New York.)
3. GOLDSTEIN, A. 1980. Thrills in response to music and other stimuli. *Physiol. Psychol.* **8**: 126–129.
4. MILLER, G. 2000. Evolution of human music through sexual selection. *In* *The Origins of Music*. N. Wallin, B. Merker & S. Brown, Eds.: 329–360. MIT Press. Cambridge, MA.

5. SPENCER, H. 1857. The origin and function of music. *Fraser's Magazine* **56**: 396–408.
6. SCHERER, K.R. 1995. Expression of emotion in voice and music. *J. Voice* **9**: 235–248.
7. JUSLIN, P.N. & P. LAUKKA. 2003. Communication of emotions in vocal expression and music performance: different channels, same code? *Psychol. Bull.* **129**: 770–814.
8. PLOOG, D. 1992. The evolution of vocal communication. *In* *Nonverbal Vocal Communication: Comparative and Developmental Approaches*. H. Papoušek, U. Jürgens & M. Papoušek, Eds.: 6–30. Cambridge University Press. Cambridge.
9. EKMAN, P. 1992. An argument for basic emotions. *Cogn. Emotion* **6**: 169–200.
10. JUSLIN, P.N. & P. LAUKKA. 2001. Impact of intended emotion intensity on decoding accuracy and cue utilization in vocal expression of emotion. *Emotion* **1**: 381–412.
11. SCHERER, K.R. 1986. Vocal affect expression: a review and a model for future research. *Psychol. Bull.* **99**: 143–165.
12. BACHOROWSKI, J.-A. 1999. Vocal expression and perception of emotion. *Curr. Directions Psychol. Sci.* **8**: 53–57.