Visual Influences on Music Perception and Cognition

Visual influences on music listening can be divided into two groups: those affecting cognitive evaluations of music, and those affecting perception of the acoustic signal. Although differentiating between the two is in some cases difficult, the distinction is helpful both in understanding the degree to which the cross-modal influence is obligatory, and in guiding efforts to connect this research with broader inquiries of audiovisual integration within the psychological sciences.

The fact that vision affects a broad range of musical evaluations is recognized by normative standards for concert dress and stage performance. Many orchestras employ "blind auditions" in which committees sit behind a screen to avoid extra-acoustic influences on their evaluations. Studies of visual influences use a wide range of approaches, including comparing differences in judgments of a performance's expressivity, quality, or musicality when using either restrained or elaborate body movements. Participants then rate these performances under audiovisual and audio-alone conditions, allowing for direct exploration of vision's influence.

Some researchers use carefully manipulated videos that isolate a single aspect of a performance (i.e., a singer's facial expressions), as well less controlled but more realistic approaches such as presenting sections of well-known compositions performed by professional musicians, or excerpts of high-stakes piano competitions. Other approaches consist of exploring the degree to which musically relevant information, such as a performer's emotional intentions and/or expressivity, or even other qualities such as an audience's level of interest, can be conveyed through

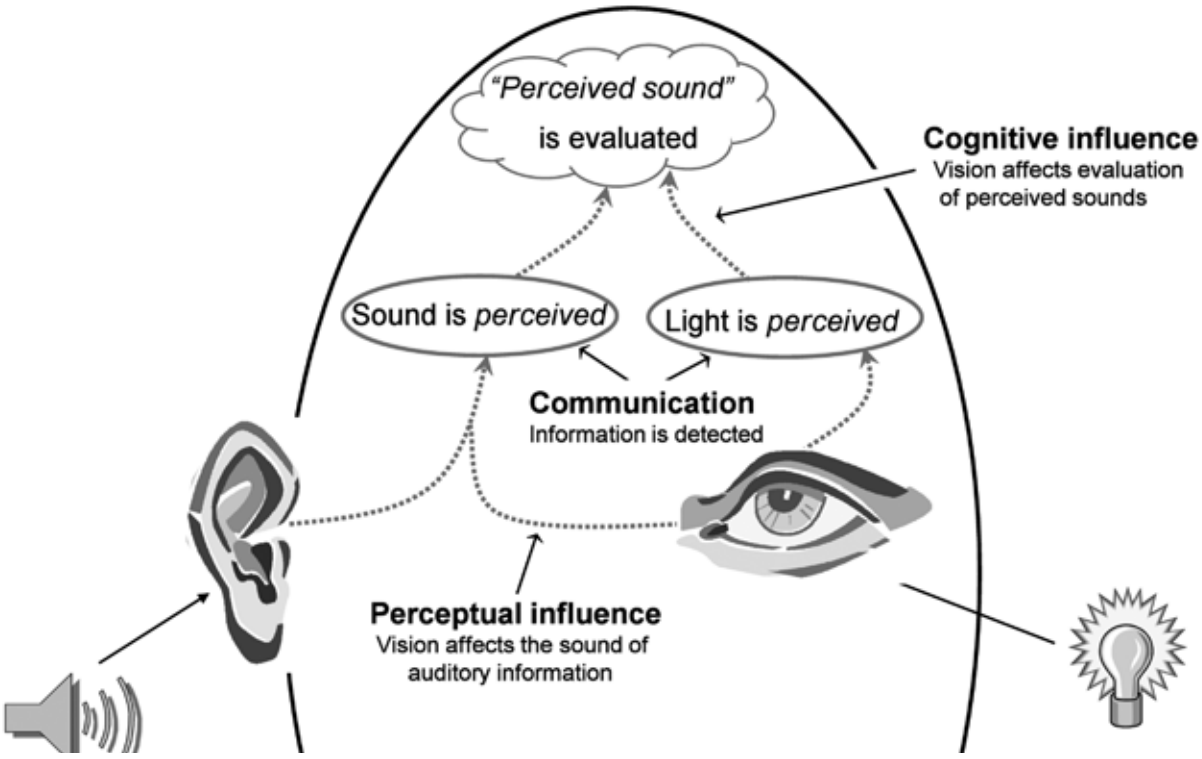

Figure 1 *Levels of visual influence. Visual information can affect the musical experience by either (a) affecting one's perception of acoustic information or (b) altering one's cognitive evaluations of this information. The distinction between these two types of influence is helpful in placing these effects within a larger framework of audio-visual integration—an issue of relevance and interest to a wide community of researchers within the psychological sciences.*

Source: Schutz, M. "Seeing Music? What Musicians Need to Know About Vision." *Empirical Musicology Review,* v.3/3 (2008). Reprinted with permission.

the visual modality alone. The implication of this latter approach is that this information is then used when evaluating audiovisual performances.

Together, this work documents that not only can visual information communicate musically relevant information, it actually does alter evaluations, including those made by expert musicians. This influence occurs despite evaluators' belief that they are focused more on sound than sight. This raises important questions about whether the influence is obligatory, or whether it can be mediated by audiences who might wish to base their evaluations on the sound alone.

Although some types of visual influence might be reduced or even eliminated based on the goals of a jury/audience, other influences on low-level perception of basic musical properties such as timbre, loudness, and pitch perception are obligatory—beyond conscious control. For example, judgments of the emotional quality of major musical intervals can be strongly affected by visual information. Musical intervals were judged "happier sounding" when paired with the lip movements and facial expression used to produce a major third (nominally "happy"), than when paired with the lip movements and facial expression used to produce a minor third (nominally "sad"). This influence occurred when participants were asked to ignore visual information, and persisted even when their visual attention was split between other concurrent tasks.

Visual information can not only affect, but actually improve perception of musical information, such as when it helps enhance listener comprehension of sung lyrics. In some cases, it allows performers to overcome acoustic limitations of their instruments. For example, professional percussionists use physical gesture length (i.e., the down and up motions used to strike an instrument) to control their audiences' perception of the durations of notes played on the marimba. This is particularly useful because percussion (in contrast to wind, string, and voice) instruments rarely offer the ability to acoustically control duration. Although this illusion has thus far only been studied on the marimba, the broad range of instruments employed suggests that visual information can play a role in many kinds of musical performances. One of the few musical qualities that has not yet been shown to be influenced by visual information is that of musical timing, such as rhythm, pulse, and meter. While watching performers' body movement does not appear to affect listeners' understanding of these properties, listeners' body movements can significantly affect the musical experience.

Sensorimotor Interactions: Feeling the Beat

Moving to the beat while listening to a metrically ambiguous rhythm can actually change the understanding of its metric structure. Bouncing on every second or third beat affects subsequent evaluations of the sound's meter (i.e., 2/4 or 3/4), indicating that movement can shape the way in which these sounds are heard and remembered. This effect appears independent of culture-specific training or extensive personal experience because it occurs even in 7-month-old infants. Similarly, moving while listening can affect one's ability to extract a pulse (i.e., "find the beat") from rhythmic sequences. Moreover, beyond changing the perception of timing information, movement can objectively improve rhythmic acuity. For example, listeners demonstrate greater sensitivity to rhythms when tapping along while listening, rather than when listening without moving. These links between movement and rhythm are powerful, innate, and ancient. Motor areas of the brain exhibit activation when passively listening to rhythms, even when these rhythms have not been previously performed by the listener.

Other Non-Auditory Factors and Cross-Modal Musical Mappings

Factors beyond concurrent sensory information can also affect one's experience of a musical performance. Past memories/associations are as powerful and ubiquitous as they are idiosyncratic, such as the "Honey, they're playing our song!" effect in which associations of past listenings affect present hearing. Extramusical associations, program notes, and contextual knowledge can all shape, personalize, enhance, and on occasion obfuscate the intentions of composers and performers. Music listening also contains social components because listening is markedly different when sitting at home alone than amid thousands of screaming fans in a large arena.

Finally, one can on occasion feel the energy from sound waves, such as when listening to

low bass notes over powerful car stereo speakers. Moreover, efforts to map acoustic information onto other modalities demonstrate that certain aspects of music can be amodally conveyed. For example, efforts to convert sound to tactile feedback "translate" the auditory-based phenomenon of music to other sensory modalities. This approach even allows hearing impaired and deaf individuals to experience music in some form. Additionally, visual representations of audio files in a sonogram or other graphic format permit certain aspects of music to be communicated without sound. Together, they demonstrate that certain aspects of musical structure may be broadly experienced.

What Is Music?

The fact that music involves more than auditory information raises important and intriguing questions about what music really is. If visual and haptic (i.e., movement) information affects the musical experience, and in some cases forms a strategic part of performers' efforts to communicate with their audiences, then to some extent key aspects of a musical performance are lost in representations and analyses focusing on sound alone. Music is ultimately an auditory phenomenon, but it involves more than simply the acoustic signal. Extra-acoustic information can be used to supplement, enhance, and overcome problems with the sounds produced by instruments. However, employed improperly, it can distract an audience and/or impair important musical features. Therefore, although it is imprudent to ignore its influence when assessing the perception and reception of music, musicians must make personal decisions about the degree to which they will consciously incorporate extra-acoustic factors into in their performances.

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See Also: Facial Expression; Music Cognition; Music Videos; Perception; Vibrotactile Devices for the Deaf.

Further Readings

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Music, Definitions of

Ideally, a definition of music will identify the features possessed by all (necessary conditions) and only (sufficient conditions) instances of music and in terms of which they count as music. Most common, simple definitions of music do not meet this standard. For instance, the suggestion that music is "organized sound" identifies a condition that is, at best, only necessary. Any linguistic utterance satisfies this condition, so satisfying it cannot be sufficient for something's being music.

Dictionary definitions fare no better. The *Concise Oxford English Dictionary* says that music is "the art of combining vocal or instrumental sounds (or both) to produce beauty of form, harmony, and expression of emotion; the sounds so produced; musical compositions." The last suggestion fails as a definition by virtue of its circularity, and the second refers one back to the first.

In the first, the word *art* is ambiguous and problematic. If it means "skill," it suggests that the school orchestra's rendition of its national