

The Mind's Ear: Musical Imagination and Musical Imagery

What does it mean to imagine sound? Is a person who thinks he hears his name spoken in a crowd imagining a sound? Is a child who plays a game with her talking stuffed animals imagining sounds? A violinist waiting backstage before a performance, thinking about the first notes of what she will play? Someone thinking nostalgically about summer days at the seashore? A classroom full of students watching someone pretend to rake his fingers across a chalkboard? A teenager who just can't get the latest pop song out of her head? A mime who turns his head, then opens an imaginary door? A philosopher, thinking about unseen trees falling in forests? Is the hallucinating schizophrenic *imagining* sounds? Surely if anyone has ever imagined sounds, Beethoven did when he composed orchestral masterpieces in profound deafness.

There is some sense in which all these examples might involve imagining sounds. But perhaps the violinist is only thinking that the first note of her piece is an F#, and not thinking about what that F# sounds like. The mime might tell us he is pretending that he hears a doorbell, but this pretending may or may not involve internally 'hearing' the bell. If we ask the child what her stuffed gorilla sounds like, she could imitate its voice, or she could just as easily laugh at us, saying he doesn't *really* talk, she is just pretending that he does. The students who react by cringing violently at the thought of fingernails on a chalkboard might protest that they aren't doing any imagining, or anything else for that matter. They are having something done *to* them. So too those who have songs stuck in their heads, or those who hallucinate. They don't imagine in any voluntary sense, they merely find certain things occurring within their consciousness. Perhaps thoughts of the

seashore include imagined sounds of the sea, but this is only one of many ways to remember that experience. The philosopher might report that he is merely entertaining the proposition that a falling tree makes a sound; there is nothing imaginative going on in his mind.

But what about Beethoven? There was some inner experience that resulted in his writing down thousands upon thousands of beautiful notes on pages of blank staff paper. Does it make sense to say that this was an *auditory* experience? For every person who has said how tragic it is that Beethoven never heard his late works, there is another who will say that what he ‘heard’ internally probably sounded better than anything an orchestra of his time could produce. Beethoven’s deaf composing is the paradigm case of extremely vivid, detailed musical imagery, and musical imagery is a, if not the, paradigm case of imagining sound.

So again, what is it to imagine sounds? Perhaps the question is better stated as follows: how should we characterize the imagination such that the inner experience of musical imagery is one species of imagining? It becomes clear that there are two components of this question: first, what is the imagination; and second, what is (our experience) of auditory imagery? This paper argues that musical imagery, or the internal “hearing” of musical sounds, is a species of imagination, that it has elements of both the Kantian constructive imagination and more traditional perceptual imagination, and that current scientific studies on musical imagery give us additional reasons to adopt this view.

The study of musical imagery and its relation to the variety of things that have been termed “the imagination” over the centuries serve as an example of the way studies in music cognition can be relevant to both philosophical aesthetics and the philosophy of music, and in this case to the philosophy of mind more generally. Imagination is related to music in a number of respects: we often imagine music silently in our minds, just as we imagine visual scenes. We refer to composers, especially the most highly regarded ones, as especially imaginative. Often we claim that composers are able to be imaginative *in virtue of* imagining music internally. But for many 20th century philosophers—notably Wittgenstein, Ryle, and Scruton—it was anathema to speak of any entities existing inside the mind, whether these be pictures or sounds. Instead, imagining is simply an attitude we take. Rather than *believing* that we hear a melody when there is no actual sound present, we merely *imagine* the sound. Imagination, on Scruton’s theory, is like belief in that it is directed towards content, in this case a musical sound, but it is unlike belief in that it does not involve commitment to the existence of the sounds.

The difficulty with Scruton’s account is that it does little to explain the phenomenology of our experiences of musical imagery. We would like a theory of the musical imagination that does justice to the fact that the experience of imagining sound feels like an experience of actual sounds in important respects. Cognitive psychologists who worked in opposition to the Behaviorist school were committed to respecting this experience of imagery, and as we shall demonstrate, research in musical imagery has now evolved to the point that we understand quite a bit about the neural basis for musical imagery.

However, the situation is a bit more complicated. Because of the intellectual history of the concept ‘imagination’, it is not a straightforward matter to claim that neuroscientists can simply “discover” some internal process within the brain and call it the imagination. The term “imagination” is now used to refer to any one of several related concepts: imagination as the production of mental imagery; imagination as a faculty that organizes percepts for coherent cognition (the constructive imagination); imagination in the sense of being imaginative or creative; and imagination as a propositional attitude taken towards fictional or imaginary propositions.¹ The neural processes that underlie our experience of musical imagery can be said to be a kind of imagination in *several* of these senses. Certainly, there is an explanation of imagination as the capacity for musical imagery, and this can easily be linked to the capacity for creativity. But an explanation of the experience of musical imagery also involves an additional sort of imagination, the constructive imagination. This sort of imagination is responsible for organizing perception into coherent cognition, and is a process that takes place below the level of conscious experience. It turns out that any coherent experience of music at all must draw on imagination in this sense. In order to see how these sorts of imagination are related, and how the imagination in its multiplicity of senses came to be at the heart of aesthetics, it is necessary to review a bit of history.

The 18th century’s contribution to the conceptual development of the imagination took the form of a complicated synthesis of the first three of these senses.² In Hume’s *A Treatise of Human Nature*, the imagination is a storehouse of ideas, which are past

¹See Strawson 1974.

²For detailed histories of the imagination, see Brann 1991 and Warnock 1976.

perceptions. Cognition always involves the imagination, since it involves the comparison of present perceptions to past perceptions, or the application of general concepts, which are formed by the imagination. Having an image of something not present also involves the imagination, since this involves either the recall of a past idea from the imagination, or the construction of a new idea out of past ideas. To be imaginative in the sense of being creative, then, is to be especially innovative in constructing new ideas, whether these ideas are imagistic (i.e., sensory) or abstract. Artistic creation is a product of this imaginative activity.

Kant's view of the imagination, crucial to our understanding of aesthetic judgments, was developed with Hume's theory in mind. For Kant, the imagination is responsible for shaping sensory information from perception so that it is coherent to us. In the case of music, if we are able to hear music as an ordered succession of sounds through time, this is because the imagination structures auditory input so that this is possible.³ Further, aesthetic judgments, for Kant, arise from the harmony between the imagination and the understanding as they work together in the presence of a beautiful landscape or painting. Kant's speculative theory of the imagination, a mental faculty responsible for any sensory cognition, is also the root of his theory of aesthetic experience.

While Kant and Hume made recourse to purely speculative psychology, they identified functions of the mind in cognition, musical or otherwise, that remain relevant to the study of the mind. Even if it is not true that there is some single isolable entity in

³ See Husserl 2008.

the mind corresponding to the term “imagination”—there is no “mind’s eye”—it is still the case that we are able to hear an entire Beethoven symphony as a coherent whole, despite the fact that only an instant of it can be perceived at any given moment. We are able silently to “hear” melodies in our heads, whether these melodies are things we have heard before or things we have just invented. But we also still believe that there is a strong connection between the musical imagination, the ability to have auditory imagery, and musical composition. Determining the neurological underpinnings of our experience of auditory imagery can help untangle this conceptual web. There is some function of the brain that answers to the concept of imagination as imagery, but also to the concept of the constructive imagination.

Most of the work done on mental imagery since the 1950’s is work on visual imagery. There were two very influential sets of studies used to argue that there must be something “quasi-pictorial” in the mind corresponding to visual images. The first, by Shepard and Metzler (1971), involved mental rotation of three-dimensional objects presented in two-dimensional projections. In order to use the pictorial image to answer questions about the represented rectangular objects, subjects mentally rotated the objects using mental images. The mental image, then, must be something that can be “rotated.” Stephen Kosslyn, one of the primary proponents in the mental imagery debate, carried out further experiments to establish the spatial properties of mental imagery.⁴

⁴ In Kosslyn, Ball, and Reiser (1978), subjects were given a map of an island with three objects represented at various distances apart. They were given some time to memorize the map, and then asked questions about the objects (e.g., is the tree in between the shack and the pond?). One group of subjects was instructed to answer these questions by consulting an internal image of the map and scanning it. The group that was asked to answer by scanning took longer to answer the questions. In fact, the “scanning”

In the case of visual imagery, the preservation of the properties of perception is explained by the fact that both behaviors, vision and visual imagery, draw on processes that encode spatial properties/relations of/in the environment (e.g. topographically organized population codes of neurons in the visual cortex). Auditory imagery, specifically musical imagery, is explained in an analogous fashion. The perceptual features of auditory experience occur along three dimensions: pitch, meter (or rhythm), and timbre. Auditory imagery experiments confirm that these properties of auditory perception are preserved in auditory imagery, and that auditory imagery draws on the same neurophysiological processes in the auditory cortex as does ordinary hearing. Auditory images are arranged “tonotopically,” in the auditory cortex, just as visual images are arranged topographically in the visual cortex.

In the 1980’s, Andrea Halpern designed experiments that attempted to apply Shepard and Kosslyn’s results in visual imagery to musical imagery. The results were to link our phenomenological intuitions about musical imagery to features of these representations. We experience “inner tunes” not merely as having *some* pitch; we represent these with *particular* identifiable pitches. We can “scan” a melody by playing it in our heads, demonstrating that the representations encode temporal features, just as the mentally scanned image in Shepard’s map study encodes spatial features.

In Halpern’s musical imagery task, subjects were asked to determine whether a lyric was part of a song or not by mentally “playing through” the song (or not, for the control group). Those asked to play through the song took longer to respond. Typically,

time varied proportionally to the time it took subjects to visually scan the actual map. This was taken as evidence that the metric properties of perception are preserved in mental imagery.

subjects needed to “play through” the song from the beginning. An additional task tested pitch representation explicitly. This time they were asked whether the note corresponding to the lyric was higher or lower in pitch than the starting note. The temporal effects were more pronounced in this experiment than in the prior experiment, offering further evidence that the task required a representation drawing on the musical elements of pitch and tempo, and not something like conceptual knowledge or visual memorization of a score.

Halpern’s claims are modest: she states that her results show that auditory imagery is a “strong subjective experience”, and at least partly quantifiable. “People indeed behave as if they were running songs through their heads. That is, the evidence seems to point towards a representation that codes extension in time, that unfolds in real time, that has strong links between adjacent elements, and that is unidirectionally ordered.” (Halpern 1992)⁵ With the advent of cognitive neuroscience, there are additional methods for investigating the neural underpinnings of the mechanisms responsible for musical imagery. These include “lesion studies” on patients who have suffered strokes or other brain damage to determine the location of impairment that correlates with cognitive deficits. In addition, PET scans, fMRI studies, and other brain imaging techniques help to isolate neural activity that occurs during imaging tasks.

Recent research has shown that visual imaging tasks involve nearly identical brain areas as perceptual tasks, and Halpern and Zatorre have begun to demonstrate the link

⁵ This isn’t to say that we don’t *also* encode melodies in other ways (e.g., to know *that* a piece starts on F # requires conceptual encoding of the music-theoretical category “F#”), but it is to insist that the perceptual qualities of musical imagery that are unique to the modality of hearing must be represented in ways that are sensitive to just these qualities.

between the brain locations for music imagery and music perception. They describe their results as follows: “The “tune inside the head” is in some ways an apt description of the representation of familiar tunes. These tunes seem to be stored with much exact or analogue information.” Moreover, “real time passes while auditory images are activated, and the representations apparently include the fairly absolute information of tempo and pitch, in addition to the relative information of note and harmony relationships.” They note, however, that comparison of auditory and visual perception versus imagery cannot strictly be contrasted, since auditory perception is already a memory task, more so than is vision. That is, listening to music involves feedback loops that support working memory processes, which account for our capacity to bind tones over time into coherent auditory events. Overall, the studies in cognitive psychology and neuroscience do support the hypothesis that “parts of the cortex specialized for processing actual sound are also recruited to process imagined sound.” (Zatorre and Halpern 2005) This offers some support for the intuition that the experience of imagery is importantly like the experience of perception.

The guiding presupposition behind the neuroscience of musical imagery, as well as the claim that these studies confirm the existence of what can be referred to as the musical imagination, is that our subjective phenomenology of imaging can be usefully enhanced by grounding in cognitive science. These types of studies provide compelling evidence for a link between subjective experience and brain processes. While the philosophical discipline of phenomenology is limited by first-person point of view, and by its stance of bracketing conscious experience from any scientific claims about the

objects of that experience, paying attention to the ordinary phenomenology of experience and linking it to the findings of cognitive science can make possible the comparison of a number of first person reports and explain the source of their variation.

What philosophical purpose does it serve to show that there is a neural connection between perceiving and imagining, but no necessary connection between imagery and either language or concepts? Musical sounds, especially pitches of instrumental sounds, are not the sorts of thing that we can comprehend through multiple sense modalities. If we are to imagine musical sounds, and not just imagine *that* there are musical sounds, or that something is true of a musical sound, this imagination must be perceptual, and it must be specifically auditory. It is not enough to say, as some have done, that imagination is simply supposition, or pretend belief. This opens the way for specifically perceptual cognition, and demonstrates that the propositional imagination cannot coherently explain imagined content that has a perceptual, and not propositional, structure.

Thus, shedding light on the neural underpinnings of auditory imagery provides support for the claim that there is something that performs the functions of the musical imagination, and elucidates an important component of the musical listening experience. Auditory memories seem to be stored as past auditory percepts, and can be recalled in a way that reproduces the pitch and temporal details of the original auditory experience.⁶

⁶ Although Halpern and Zatorre did not ask subjects to compose music in their minds, it is plausible to think that composers who report “hearing” their compositions internally in a way analogous to “hearing” a remembered piece of music are drawing on the same capacity for auditory imagery. In addition, gifted composers are likely to have this capacity developed to a high degree—a link between one sort of imagination and creativity. Musicians who “rehearse” pieces internally are also reporting vivid imagery experiences. Hearing a piece that one already knows involves reviving an auditory image of that piece,

In conclusion, musical imagination involves the capacity to have internal musical imagery, and the phenomenology of these imagery experiences has much in common with the phenomenology of ordinary hearing. This is reason for thinking of musical imagination as quasi-perceptual, not propositional. But musical imagination is also constructive, in that the brain has to construct musical experience out of past musical experiences stored in memory. Thus, work in cognitive neuroscience of musical imagery can help to find the neural underpinnings of many functions traditionally ascribed to the imagination.

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drawing upon memory stores that function as a kind of constructive imagination.⁶ All of these are functions of the imagination as that concept developed in 18th century Europe.

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