



BALTIMORE JAZZ ALLIANCE

SEPTEMBER 2013

Magic at Eubie Live!	1
Jazz Improvisation: A Window into the Creative Brain	4
BJA Big Band Concert Schedule	5
Baltimore Jazz Composers' Showcase	5
Jazz Jam Sessions	9
BJA Member Notes, Products and Discounts	10
Ad Rates and Member Sign-up Form	11

Jazz Improvisation: A Window into the Creative Brain

Creative behavior is a fundamental part of our everyday lives, yet the systematic, scientific study of creativity is a fairly recent phenomenon. Proposing that creative thinking is not a magical and random event but a measurable result of ordinary cognitive processes, prominent American psychologist J.P. Guilford made a plea for its empirical study in his 1950 presidential address to the American Psychological Association.

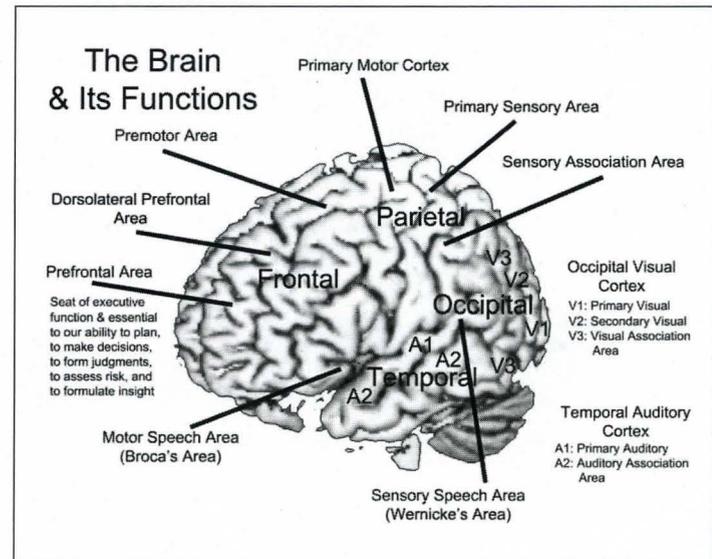
Since then, a host of psychological experiments have successfully tested problem-solving skills and the role of memory in perceiving and creating visual and auditory mental imagery. Brain-imaging techniques developed in the 1990s have further allowed neuroscientists to explore the living brain and better understand the relationships between specific anatomical areas and the function(s) they serve. We have thus learned much about such cognitive capacities as sustained and multiple simultaneous attention, working memory, information processing, pattern recognition, response inhibition, and cognitive control.

Today, as the neuroscience of creativity and innovation picks up momentum, a handful of experiments have begun to explore the process of artistic production. Whether investigating auditory or visual domains, studies have primarily focused on the cognitive spontaneous mode and worked with professional artists.

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In music, improvisation has become the current mode for studying spontaneous artistic invention. Similar to the way humans produce language, composers can generate a potentially infinite number of meaningful musical phrases by endlessly combining a finite set of notes and rhythms. As renowned ethnomusicologist Paul Berliner noted in 1994, improvisation refers to a dynamic moment in which immediate decision-making occurs as musicians conceive new ideas and integrate them into an ever-evolving output. Translated into cognitive processes, improvisation is defined as a complex interplay of working memory, knowledge, attention, information processing, and response inhibition in which musicians generate, select and execute novel auditory-motor sequences.

The availability of contemporary functional magnetic resonance imaging (fMRI) techniques, custom-built plastic key-



boards, and noise-canceling headphones permits us to study the brain during real-time musical improvisation. Since 2007, five studies have scratched the surface of this complex cognitive feat. As Limb and Braun observed in 2008, musical improvisation is a free-flowing state of heightened sensory performance where released inhibitions combine with an intense acuity of self-expression.

As a postdoctoral fellow at the Johns Hopkins University School of Medicine working with otolaryngologist Charles Limb, and an active musician/filmmaker fascinated with the role of emotion during creation and performance, I have been working with several top Baltimore-DC jazz pianists to uncover the behavioral and neural correlates of emotion during improvisation. In my current study, the musicians have come to the lab and improvised a fascinating set of compositions both on a weighted-key digital piano and on a three-octave plastic keyboard in the MRI scanner while viewing a set of images showing various emotional states. Preliminary analyses of the musicians' improvisations reveal that each emotion directly affects various musical variables like mode, key, pitch range, and velocity. Brain data suggest that emotional engagement during improvisation depends on the emotion represented in the viewed images.

What the data will probably tell us is that Oscar Peterson knew what creating and performing is all about when he said, "Too many jazz pianists limit themselves to a personal style, a trademark, so to speak. They confine themselves to one type of playing. I believe in using the entire piano as a single instrument capable of expressing every possible musical idea. I have no one style. I play as I feel."

— MONICA LÓPEZ-GONZÁLEZ

BALTIMORE JAZZ COMPOSERS' SHOWCASE • SEPTEMBER 29th • 5 to 7 pm • FREE CONCERT – Details on page 6