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Keith Lockhart, five Boston Symphony Orchestra musicians, and about 50 audience members will be wired with sensors during a concert on April 4, as part of a novel scientific experiment. Above, Teresa Marrin Nakra, one of the scientists, modeled the "Conductor's Jacket" she invented. (Zara Tzanev for the Boston Globe)

Measuring emotion at the symphony The Boston Globe

By Catherine Elton, Globe Correspondent | April 5, 2006

The movements of a conductor's baton, his free hand, and even his eyes guide an orchestra's performance. But what about when a conductor throws back his head, hops around the stage, or leaps into the air? Are these ego-driven excesses of exuberance, as some critics say, or an integral part of helping the musicians and the audience truly feel the music?

What is the conductor really doing up there and, more important, is it working?

Scientists hope to find out some answers Saturday from conductor Keith Lockhart, five Boston Symphony Orchestra musicians, and about 50 audience members who will be part of a novel scientific experiment at the Family Series matinee featuring the overture to "The Marriage of Figaro" and some Dr.

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Seuss-inspired pieces.

Instead of his usual suit jacket or tuxedo, Lockhart will wear an armband and a black Lycra top that looks more like a biking jersey. They will both be wired with a series of sensors that will measure his heart rate, movements, muscle tension, and other physiological evidence of emotion. Five musicians will be similarly wired to measure how they react to his conducting and to playing the music.

In the audience, some children and adults will wear these same sensors on their arms and fingers, allowing their bodies to tell the scientists what kinds of emotional intensity they are feeling. Others will monitor themselves, sliding a switch on a hand-held box to indicate the emotional intensity they perceive in the music.

"We are trying to get a fingerprint of the emotional landscape of the music as it is transmitted from the conductor's baton to the musicians' fingers to the hearts and minds of the audience," said Daniel Levitin, a professor of psychology and music at McGill University in Montreal, who plans to be in Boston for the experiment.

For instance, will Lockhart's flourishes during the climax of the Figaro overture translate to an increased heart rate in the orchestra and in the audiences?

"Ideally, we will see something we recognize from the conductor's reading in the musicians' readings about two seconds later, and then in the audience's readings," Levitin said yesterday.

The experiment brings together Levitin, a neuroscientist and former record producer who has worked with Santana and the Grateful Dead; Stephen McAdams, the director of the Centre for Interdisciplinary Research in Music Media and Technology at McGill University; and Teresa Marrin Nakra, a former MIT doctoral student who was also an assistant conductor for the Boston Modern Orchestra Project.

Nakra, who now teaches at the College of New Jersey, started working with the sensor shirts when she was doing research for her doctorate. She said those experiments -- which also involved Lockhart, among other conductors -- showed that conductors' gestures are based on their emotions.

But every time she presented her research, she said, people would comment that what they really wanted to know was whether the audience was feeling the same way.

"I think a lot of people wonder what the conductor accomplishes standing up there," Nakra said.

Six years later, with \$80,000 worth of sensors and the full cooperation of the Boston Symphony, Nakra and her colleagues expect to start answering that question.

The scientists are also going to videotape Saturday's performance and show it to a similarly-wired audience in Montreal to measure whether audiences react differently to live or taped performances. Lockhart said yesterday that this is the aspect of the experiment that most interests him.

"We are always talking in music circles about how no matter how good your surround-sound stereo is or how sharp your plasma screen TV and DVD player are, there is no substitute for the visceral thrill of a live performance," he said.

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While saying that he is happy to cooperate with the experiment to further science and knowledge, Lockhart is not interested in using the results to rate his own performance.

"I prefer the old-fashioned way of doing that -- hearing a sharp intake of breath from the audience, the simultaneous sigh of 2,000 people, seeing them jump to their feet and yell, 'Bravo!' " he said.

"I'm an analog guy in a digital age." ■

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