

The Mirror Game: a Natural Science Study of Performance

"The theatrical event is fundamentally a mirroring; an ensemble group is a collection of mirrors reflecting each other." (*Environmental Theater*, pp. 118).

Three fundamental methods of human inquiry, the performance arts, the humanities and social sciences, and the natural sciences, are largely disconnected. The field of Performance Studies bridges performance arts and the humanities and social sciences. We describe here work trying to bridge performance arts and the natural sciences, offering a new direction to the study of performance.

Working towards a scientific investigation of performance, we focus at first on *improvised joint creation*, asking how a group of performers, for example in jazz and improvised theater, can spontaneously create new and complex pieces together.

To empirically study this question we used the *mirror game*, a well-known practice from theater and dance. In the mirror game two players imitate each other, with or without a designated leader, creating together complex and synchronized movements. We offer the mirror game as a simple behavioral paradigm for studying improvised joint creation.

We measured the motions of pairs of improvisers playing a 1-dimensional version of the mirror game, moving handles along tracks. We present results on how expert improvisers create new movement without a designated leader. For example, we find specific frequency ranges of motion that correspond to changes between leader and follower modes. We also detect when the two players enter a flow state of high synchrony and precision.

We plan to extend this study by measuring players' physiological responses, for example, breathing rate, thus correlating bodily states with states of flow in performance. In the future, we also plan to extend these measurements to study the processes underlying the behaviors of performers and audience during live performances.

About the Author

Dr. Lior Noy is currently a postdoctoral fellow at the Weizmann Institute, studying cooperation and improvisation in small groups, continuing research he began during a postdoctoral position at Harvard Medical School. He earned a Ph.D. in computational neuroscience from the Weizmann Institute, researching the computational underpinning of human movement imitation. He also holds a M.Sc. in computer science from the Weizmann Institute, and a B.Sc. in computer science and psychology from Tel-Aviv University.

He is actively engaged in theater, in particular, since 2004, in Playback Theater. He trained and performed with the Israeli Playback Ensemble, the Boston-area True Story Playback Theater, and recently, the Kartoshkes ensemble (performing regularly at the Cameri

Theater). In total, he has participated in 70+ improvised performances as a playback actor and conductor. In 2006 he established and led the 'Weizmann Playback', a group of 15 faculty and students training and performing regularly at the institute and in community centers in the area.

His main research project is an attempt to establish an empirical science of improvised group performances. Additional research areas include computational motor control, robotics, and creativity.