# AbstractID: 13399 Title: Audiovisual biofeedback significantly reduces motion blurring artifacts in four-dimensional (4D) PET images

**Purpose:** To investigate the hypothesis that audiovisual biofeedback reduces motion blurring artifacts in 4D PET images.
**Method and Materials:** 4D PET scans were acquired on a GE PET/CT scanner using audiovisual biofeedback guided and free breathing traces. A static image was used as the reference. The physical phantom consisted of six hollow spheres (NEMA ICE body phantom) with 10, 13, 17, 22, 28 and 37 mm in diameter as targets and a cylinder (Hoffman 3D brain phantom) as background. The sphere targets were filled with $^{18}$F-FDG at a fixed target-to-background ratio (8:1) based on 10 mCi/70 kg. The phantom was placed on a 3D programmable motion platform which produced the breathing patterns of four subjects with and without audiovisual biofeedback. 4D PET images with five respiratory bins were reconstructed for each breathing pattern. The segmented volumes, dice coefficients, 1D profiles, and 2D profiles were determined for evaluation and compared for each respiratory bin. The breathing patterns were analyzed for correlation between irregularity of breathing and motion blurring.
**Results:** Audiovisual biofeedback significantly reduced motion blurring by 16.5% (1D profile, p=0.004), 22.6% (2D profile, p=0.003), 34.5% (volume, p=0.009) and 6.5% (dice coefficient, p=0.004) on average for the small spheres (≤17 mm), and by 4.3% (p=0.008), 2.7% (p=0.104), 0.7% (p=0.446) and 5.0% (p=0.014), respectively, for the large spheres (≥20 mm)**.** In general, 4D PET motion blurring was dependent on the magnitude and irregularity of motion.
**Conclusion:** The first investigation of the effect of breathing training on 4D PET images has been performed. The results indicate that audiovisual biofeedback can significantly reduce motion blurring in 4D PET images and may facilitate improved identification and localization of small lung tumors.
**Conflict of Interest:** Supported by NIH/NCI R01 93626