PURPOSE: We hypothesized that real-time MRI could be used to image cardiac function during peak physiologic stress.

METHOD/MATERIALS: Ten healthy volunteers (6 male, 4 female, aged 32±6) were studied in a 1.5 T MRI scanner using an MRI compatible ergometer. Seven short axis cine imaging planes were acquired at rest and within 29±6 seconds after stress using real-time FGRE-ET with UNFOLD. The scan duration for each image was 31 milliseconds. Ejection fraction (EF), ejection rate (ER), and percent systolic wall thickening (%SWT) were measured at rest and stress.

RESULTS: The average heart rate increased from 61±8 to 154±16 bpm with exercise. Systolic blood pressure increased from 126±13 to 163±13 mm Hg (p<0.0001). The rate pressure product increased from 7,675±1,536 to 25,070±3,364 bpm x mm Hg (p<0.0001). EF increased from 72±6 to 85±8 % (p<0.0001). ER increased from 249±66 to 429±89 ml/s (p<0.0001). %SWT increased from 101±23 to 138±19 % (p<0.0001).

CONCLUSIONS: Real-time MRI allowed the quantitative assessment of global and regional systolic function during a high level of physiologic stress and showed significant increases compared to resting values.