Caffeine and Taurine Containing Energy Drink Improves Systolic Left-ventricular Contractility in Healthy Volunteers Assessed by Strain Analysis Using Cardiac Magnetic Resonance Tagging (CSPAMM)

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SUBSPECIALTY CONTENT
- Cardiac Radiology

PURPOSE
Energy drinks (ED) usually contain a high amount of caffeine, taurine, and sugar as their main ingredients. Although their consumption appears not uncrical, there is little or no regulation on ED sales so far. Concerns about adverse side effects especially focus on heart function in adolescents and young adults. In this study, we investigated the effect of ED consumption on myocardial function in healthy volunteers using MRI tagging and strain analysis.

METHOD AND MATERIALS
18 healthy volunteers (15 male, 3 female, mean age: 27.5 years) were investigated using cardiac magnetic resonance imaging (CMR). CMR was performed on a 1.5-Tesla whole body scanner directly before and 1h after consumption of a taurine (400 mg/100 ml) and caffeine (32 mg/100 ml) containing ED (168 ml/m2 body surface area). For left-ventricular (LV) myocardial tagging, complementary spatial modulation of magnetization (CSPAMM) was used. Strain was calculated for peak strain (PS), peak systolic strain rate (PSSR) and peak diastolic strain rate (PDSR) using TagTrack (Gyrotools, Zurich, Switzerland). Steady state free precision (SSFP) cine imaging was used for determination of LV function. Additionally vital parameters such as heart rate (HR) and blood pressure (BP) were recorded throughout the investigation.

RESULTS
PS and PSSR as parameters for systolic LV-contractility were significantly increased 1h after ED consumption compared to baseline (PS: w/o ED -22.33 ± 1.7; w ED -24.15 ± 2.4; p=0.01; PSSR: w/o ED -1.18 1/s ± 0.08; w ED -1.30 1/s ± 0.16, p=0.01). PDSR as a parameter for diastolic LV-relaxation was slightly, but not significantly higher compared to baseline (PDSR: w/o ED 1.90 1/s ± 0.33; w ED 2.09 1/s ± 0.44, p=ns). No significant changes were found for LV-function (LV-EDV: w/o ED 141 ml ± 31; w ED 145 ml ± 33; LV-EF: w/o ED 64 % ± 4; w ED 66 % ± 8) and vital parameters (HR: w/o ED 63 1/min ± 9; w ED 62 1/min ± 7; BP: w/o ED 113/62 mmHg; w ED 117/64 mmHg).

CONCLUSION
This work reveals that ED consumption has a short-term impact on cardiac contractility, therefore further studies have to evaluate the impact of long-term ED consumption and the effect of ED on patients with heart disease to determine potential risks or benefits of ED consumption.

CLINICAL RELEVANCE/APPLICATION
ED consumption lead to changes in LV-contractility, which can be assessed by CMR tagging and strain analysis.