Reliability and precision in electromyographic median power frequency of shoulder muscles during running.

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Electromyographic (EMG) median power frequency (MPF) is often used to quantify neuromuscular fatigue (NMF). Though upper body muscles are active during running, there is little published describing NMF in these muscles during running. It is therefore necessary to determine the reliability and precision of MPF in specific upper body muscles during running to further study NMF in these muscles. PURPOSE: To determine the intra-session reliability and precision of MPF of the anterior (AD), middle (MD), and posterior (PD) deltoid and upper trapezius (UT) during running. **METHODS:** Fourteen competitive male distance runners (age: 23.3 ± 4.6 yrs, mass: 67.1 ± 8.1 kg, VO₂max: 72.3 ± 5.7 mL/min/kg) were equipped with an EMG system and surface electrodes were placed on the AD, MD, PD, and UT. Subjects ran on a treadmill at a heart rate corresponding to 70-80% of VO2max for 10 minutes. Twenty-five strides of data were recorded every minute. A 30-500Hz band-pass filter was applied to EMG data to reduce movement artifact. The MPF of each muscle was calculated for each minute. Intra-class correlation coefficients (ICC) and standard error of measurement (SEM) were calculated for the MPF of each muscle using the ninth (t_9) and tenth (t_{10}) minutes of the run. **RESULTS:** Heart rate during the run was $71.9 \pm 5.1\%$ of VO₂max. Data are presented in the table.

Muscle	Mean ± SD (Hz)	Mean ± SD (Hz)	ICC (2,1)	SEM (Hz)
	t9	t ₁₀		
AD	66.7 ± 10.48	66.3 ± 11.16	0.963	2.14
MD	74.2 ± 14.27	76.2 ± 14.76	0.907	4.49
PD	75.8 ± 14.81	75.5 ± 14.47	0.964	2.81
UT	81.1 ± 12.00	80.0 ± 11.20	0.952	2.63

CONCLUSIONS: ICC values > 0.90 and relatively small SEM indicate excellent intra-session reliability and precision for MPF data of the selected shoulder muscles during running. The intensities used in this study likely allowed subjects to attain a steady state, minimizing variability between measurements. These results suggest that MPF of these muscles can be measured in future research to quantify NMF during running.