PURPOSE: The purpose of this study was to develop a preventive exercise protocol based on structural and functional changes present in shoulder joints of young throwing athletes. As a proof of concept, these changes were previously evaluated in a cross-section of high-performance junior javelin throwers. METHODS: Thirteen members of the German and Bavarian junior javelin squad (mean age 17.5 +/- 0.8 years) completed a systematic clinical examination, shoulder range of motion (ROM) measurement, and were scored with standardized clinical tools. 3.0 tesla magnetic resonance imaging (MRI) was conducted on both shoulders. Bilateral three-dimensional analysis of the scapulothoracic motion during multiplanar humeral elevation and isokinetic strength testing of the shoulder internal and external rotators was accomplished. Based on the findings, a preventive exercise protocol was confirmed. RESULTS: Dominant internal ROM was significantly decreased (dominant 48 degrees +/- 20 degrees vs. non-dominant 57 degrees +/- 19 degrees; \( P = 0.006 \)) and dominant external ROM increased (dominant 117 degrees +/- 15 degrees vs. non-dominant...
107 degrees +/- 10 degrees; P = 0.008). MRI revealed posterosuperior intraosseous cysts of the humeral head with a size larger than >3 mm in 69% of the dominant shoulders and only in 15% in the non-dominant shoulders. Motion analysis of the static scapular resting position was significantly different between dominant and non-dominant sides regarding anterior tilt (dominant vs. non-dominant, mean difference 4.2 degrees, P = 0.010) and retraction (dominant vs. non-dominant, mean difference 2.4 degrees, P = 0.038). Dominant scapular anterior tilt during flexion and abduction was significantly increased (-4.3 degrees, P = 0.006; -3.4 degrees, P = 0.046). Dominant retraction was significantly increased during abduction (-2.3 degrees, P = 0.040). Isokinetic outcome parameters presented nonsignificant bilateral differences. CONCLUSIONS:

Elite junior javelin throwers already present structural (humeral intraosseous cysts) and biomechanical changes (ROM deficits and asymmetric scapulothoracic motion patterns), even if they have no history of major shoulder pain or injury. A novel exercise protocol was developed in order to address the complex of alterations in a comprehensive way. Preventive diagnostics in combination with a systematic all-year preventive exercise intervention might be one option to detect and control risk factors of a symptomatic throwing shoulder at an early stage. LEVEL OF EVIDENCE: IV.