TWO-DIMENSIONAL VIDEO ANALYSIS DURING RUNNING IN RECREATIONAL RUNNERS WITH AND WITHOUT RUNNING-RELATED KNEE INJURY

Introduction The aim of this study was to compare running kinematics between recreational runners with and without running-related knee injury using two-dimensional video analysis. Materials and methods Forty-two recreational runners (18 injured, 24 non-injured) participated in the study. The injured group consisted of runners with anterior or lateral knee pain, resulting in altered running activity for at least one week. All participants ran on a treadmill at preferred speed. Digital videos were recorded in the frontal and sagittal plane with two iPads. Outcome measures included foot and tibia inclination at initial contact, and lateral trunk position, contralateral pelvic drop, femoral adduction, hip adduction, knee flexion and ankle dorsiflexion during midstance. All angles were manually measured during Kinovea and an average of seven consecutive frames were included (age: 44±11 y; height: 171±10 cm; mass: 70±12 kg; VISA-A score: 71±10; current mileage: 40±29 km/wk). Participants completed a 7 min run at endurance pace (2.9±0.3 m/s) on an instrumented treadmill with retroreflective markers affixed to their lower extremities. After a 6 min familiarization period, marker trajectories and ground reaction forces were sampled. Sagittal plane ankle joint moments and powers were calculated and a musculoskeletal model was used to estimate Achilles tendon loads. Pain-pressure threshold, tendon geometry, and calf muscle endurance were measured bilaterally with algometry, ultrasound imaging, and the heel-rise endurance test, respectively.

Results Side-to-side differences in pain-pressure threshold were significantly related to side-to-side differences in Achilles tendon loading rate (r=0.62; p=0.03) and peak plantarflexion moment (r=0.58, p=0.05). Side-to-side differences in peak eccentric ankle joint power were significantly related to side-to-side differences in tendon thickness (r=0.59, p=0.04) and cross-sectional area (r=0.73; p=0.01). Side-to-side differences in calf muscle endurance were significantly related to Achilles tendon loading rate (r=0.64; p=0.03).

Conclusion Clinical measures of pain and calf muscle endurance relate to side-to-side differences in Achilles tendon loading rates during running, while tendon geometry relates to eccentric ankle joint power.
contains ten items of which the last three concerns tasks that some patients cannot and some do not perform. No manual for the use of ATRS has been developed. The purpose was to investigate how ATRS responds at 4, 6 and 12 months after rupture and develop a manual for the use of ATRS.

**Materials and methods** This study was performed as a retrospective registry study analysing prospectively gathered data from the Danish Achilles tendon Database. The data was gathered 4, 6 and 12 months after rupture. The original score based on 10 items was compared with a score based on the first 7 items adjusted to the same scale as the original score. Density- and scatterplots were made and differences between the scores were tested by t-test or Mann-Whitney U test.

**Results** 2790 completed ATRS scores were included. The 7-item score statistically significantly overestimated the value of the 10 items score at all time points (p<0.001) but only at 4 months the difference was clinical relevant (9.7 points).

**Conclusion** The ATRS cannot be recommended for use at 4 months past rupture, as the last 3 items skew the score. If the ATRS is used before 6 months the last three items could be omitted. A manual for the use of the ATRS will be developed defining how and when the score should be applied.

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### VALIDATION OF ACHILLES TENDON LENGTH MEASURE AND ACHILLES TENDON RESTING ANGLE IN RELATION TO COPENHAGEN ACHILLES LENGTH MEASURE

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**Introduction** Elongation of the Achilles tendon after rupture is a frequent and overlooked complication. The Achilles Tendon Length Measure (ATLM) and the Achilles Tendon Resting Angle (ATRA) are indirect length measures using the resting angle of the ankle. Copenhagen Achilles Length Measure (CALM) is a direct ultrasound measure. Examination of the association of elongation to valid clinical measures of the length of the Achilles tendons are needed. The purpose was to examine the concurrent validity of ATLM and ATRA in relation to CALM within one year of rupture.

**Materials and methods** The study was performed as a validity study. Data were collected from patients included in a randomized controlled trial. Mixed linear regression, controlling for time after injury, age and gender, was performed investigating the three models (dependent-independent): CALM-ATRA, CALM-ATLM and ATRA-ATLM.

**Results** 130 patients were included (23 women, 107 men) mean age 41.8 years (SD 10.5). All three regression models demonstrated a statistical significant (p<0.01) linear relationship. For each degree ATRA increased, CALM increased with 1.6 degrees. For each cm ATLM increased, CALM increased with 1.7 mm. For each cm ATLM increase, ATRA increase with 0.39 mm. For each cm ATLM increased, CALM increased with 1.6 degrees.

**Conclusion** ATRA and ATLM were found to have a linear relationship to CALM and seems valid as surrogate measurements for the assessment of tendon elongation after an Achilles tendon rupture.

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### EVALUATION OF IN-EAR SENSOR SYSTEMS FOR QUANTIFYING HEAD IMPACT EXPOSURE IN YOUTH FOOTBALL

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**Introduction** Wearable sensor systems may be useful for measuring head-impact exposure. Here, we tested the validity of in-ear sensors developed to improve head coupling.

**Methods** First, the sensor was mounted to a Hybrid III headform (HIll) and impacted with a linear impactor or football. Peak linear acceleration (PLA), peak rotational acceleration (PRA) and peak rotational velocity (PRV) were obtained from both systems; random and systematic error were calculated using HIll as reference. Then, six youth football players wore sensors and performed a structured training protocol.