Conclusion: Differences in vertical stop jump movement were observed between anticipated and unanticipated conditions, but not between college and high school levels of the female players.

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Comparison of three force-position hybrid control methods of a robot-based system for biomechanical testing of the knee joint

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Introduction: Robot-based joint testing systems have been used in the study of joint biomechanics over the last decades. These systems often perform laxity tests under a force-position hybrid control method, measuring the stiffness of one degree-of-freedom (DOF) of the joint while keeping the other DOF's free to move and of loads. However, no study has evaluated quantitatively the performance of this method and other alternatives. The current study aimed to bridge the gap.

Methods: A robot-based joint testing system (RJTS) was developed for the biomechanical testing of human joints using a commercial 6-DOF robot with a 6-DOF load-cell attached at the effector. The force-position hybrid control method and two alternative methods, namely force-position alternate control, and force-position hybrid control with force-moment control, were implemented on the RJTS and their performance was compared quantitatively on a human knee cadaver in terms of the stability, precision and the time required for an anterio-posterior laxity test under a maximum force of 100N.

Results and Discussion: For a complete cycle of the anterio-posterior laxity test, the time required for the force-position hybrid control method was significantly less than those of the other methods, but it had the worst precision. The proximo-distal force component did not appear smoothly controlled, showing several peaks throughout the cycle. For the other DOF's that should be kept free to move and of loads, the force-position hybrid control method also had the largest non-zero force-moment deviations among the three methods, suggesting that it was the least stable method. From the results it appeared that the force-position hybrid control with force-moment control was the best in stability and precision although requiring a bit longer than the force-position hybrid control method. It is suggested that the force-position hybrid control with force-moment control be used in future biomechanical testing studies on human joints.

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A constitutive model for the rheological behavior of sheep rumen digesta

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In this work we used rheometer measurements to determine a non-Newtonian model describing the small strain rheology of rumen digesta. Rumen digesta were collected from three sheep fed ryegrass and subjected to small amplitude oscillatory shear testing on a rheometer using a parallel plate geometry at a constant strain rate of 1% and a frequency range from 0.01 Hz to 100 Hz. The digesta were found to exhibit shear thinning behavior that was well described by a power law model with a flow behavior index of approximately 0.05. The storage modulus and loss modulus were frequency dependent and exhibited a crossover in the frequency range 40–60 Hz The Cox-Merz relationship was satisfied over a limited frequency range from 0.01 Hz to 0.1 Hz. Inter-animal and intra-animal variation in the measured quantities was found to be on the order of 20%.

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Biomechanical properties and constitutive modeling of human ventricular myocardium

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In the multidisciplinary field of heart research it is of utmost importance, for the description of phenomena such as mechano-electric feedback or heart wall thickening, to accurately identify the biomechanical properties of the myocardium. Hence, mechanical