BIOMECHANICAL RESPONSES TO REPEATED STRETCHES IN HUMAN M. RECTUS FEMORIS

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Numerous investigations have demonstrated the decline of passive torque of hamstrings as a response to repeated stretches. In this context the specific characteristics of hamstrings – muscle fibre type distribution, arrangement of fibres etc. – require a verification of scientific results before generalising them by means of an adequate comparison with other groups of muscles. The comparison with the rec. fem. is foremost possible because of the following development of the investigations concerning the topic of "stretching" of the last years. Because Range of motion (ROM) is attributed to peak torque in the final position and these two variables to the stretch tolerance, both possess just one restricted relevance concerning the response of stretching to the length-resting-tension curves of muscles. Thus the resting tension of muscles in an angel below ROM resp. the decline in tension (delta torque) during a static phase has gained more attention during the last years. A side effect of this development is that by this method of research the effect of treatments can also be verified for those muscles which don't limit the ROM of the respective joint.

Testing-Protocol: 1) Measurement of EMG during maximal voluntary contraction (MVC) of hamstrings and of rec. fem.; 2) The subjects were placed on the experimental station on their left side to perform the stretch procedure in the horizontal plane in order to eliminate the effects of gravity, i.e. displacement of blood (see Fig. 1); 3) Test:, 3.1) One measurement of ROM; 3.2) One measurement of tension torque at 7,5 degrees below ROM; 4) Treatment: 15 stretches; 5) Retest: 5.1) ROM; 5.2) One measurement of tension torque in the angel identical to test 3.2. EMG of hamstrings and of rec. fem., passive tension and knee joint angel were recorded for a time span of 25 s. After a dynamic stretch phase of 6 s. the lower leg was fixed for 12 s. (static phase) and returned to the starting position in a dynamic phase of 6 s. (see Fig. 2).

Only 5 of the10 subjects did reach contact of the thigh with lower leg. The ROM of the other 5 subjects inclines significantly (test 3.1 => test 5.1, 5,54°, p = 0,032). Tension torque declines from 24,9 Nm (test 3.2) to 21,7 Nm (test 5.2; difference: 3,2 Nm, resp. 12,8%, p = 0,001). The reflex activity of rec. fem. seems to be less than the one of hamstrings during passive knee extension test. The measurement of tension torque in an angel below ROM is suitable to proof the effects of treatments to the M. rectus femoris.

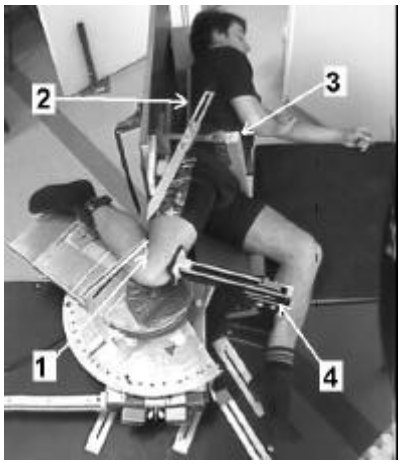

Fig. 1: Experimental conditions 1: pointer to align the axis of knee joint with the axis of rotation disc; 2: hip joint extension: 20°; 3: Pelvic strap, 4: Thigh strap

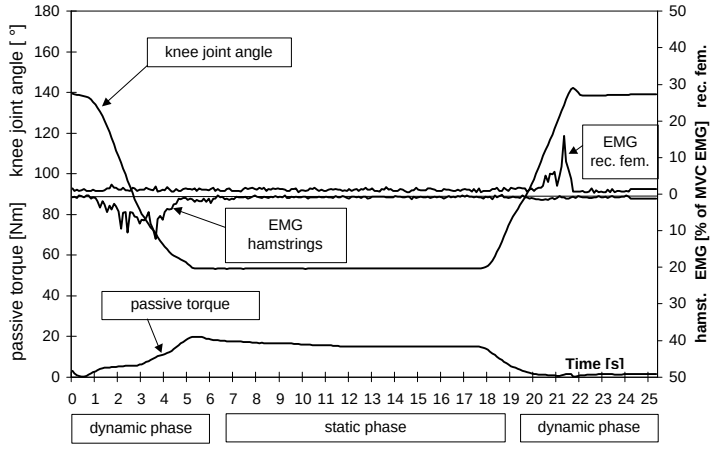

Fig. 2: The data recording of a stretch manoeuvre for one subject

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