Introduction:
In Literature, only active and passive stretching-methods are described. More recent investigations under laboratory conditions either consider only passive execution forms or do not indicate accurately, which methodology was applied. Under sport-practical criteria a more intensive effect and a larger range of motion is attributed to the direct self-stretching, as the most simply feasible and the most frequently used method in practice, shows equally good effects as the indirect self-stretching concepts (Fig. 1), allows definition of self-, and external-regulated parts during stretching-exercises, and clearly differentiates between the varying conditions. The following application of self-, and external-regulated stretching further compares these results against indirect external-regulated data.

Material and Methods:
27 sport students [m=16, w=11]; 25±2 years; 68±10 kg; 176±8 cm] were divided into three groups at random and completed to checkup the hamstring muscles three standardized test forms in each case. Test 1: Direct self-stretching (DS) by independent stretching through a rope, Test 2: Indirect self-stretching (IS) whereby an engine was controlled by the test person and Test 3: Indirect external-stretching (IE) as the test leader operated the engine. The parameters utmost range of motion (ROMmax) with a three-dimensional movement-analysis-system, traction-force (TF) at constant angle of the first ROMmax in each case, most tolerable traction-force (TFmax) with a force receiver in both cases and muscle-activity (MA) of the M. biceps femoris with EMG were measured. With each course, the test leg was brought into maximum stretch 15 times and then relaxed immediately. To relativize the muscle-activity (%MA), a maximum voluntary contraction was executed at each test form 5% below the average ROMmax.

Results:
In the case of the three methods, high significant changes emerged after 15 maximum stretches (p<0,001). ROMmax increased itself with DS as well as with IE about 9% and with IS about 8%. TF decreased with DS about 21%, with IS about 20% and with IE about 22%. TFmax rose with DS about 12% and with IS as well as with IE about 13%. MA was reduced with DS by 6% and with IF by 14% and climbed with IS about 16%. %MA decreased with DS about 5% and with IE about 13% and increased with IS about 6% (Tab. 1). Concerning the effectiveness, no differences existed between the three stretching-types. In the average, with DS ROMmax was 5% higher than with IS and IE (p<0,001). In the mean, TF was with DS 4% lower than with IS and 13% deeper than with IE. The average values for TFmax were with DS 1% lower than with IE and manifested equally strong like with IS. MA was in the average with DS 5% more inferior than with IS (p<0,01) and 40% lower than with IE (p<0,01). In the middle, %MA lay with DS opposite IS 47% deeper and opposite IS 13% deeper. Between the two indirect procedures, on the average no significant differences could be proved for the tested parameters. With DS significantly higher ROMmax with simultaneous clearly removing TF and smallest MA than with the indirect procedures were measured (Fig. 2).

Discussion:
The three methods were conducted with the parameters ROMmax, TF and TFmax to identity changes during the process of 15 repeated maximum stretches (compare 1). The direct self-stretching, as the most simply feasible and the most frequently used method in practice, shows equally good effects as the indirect methods with constantly larger ROMmax by clearly diminishing TF and lowest absolute and relativized MA.

Literature: