"Stretching optimization of the posterior chain of the lower limbs: comparison between two different executions of the same exercise"

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ABSTRACT: stretching of the posterior kinetic chain muscles, especially the hamstrings, is one of the most practiced exercises in all types of physical activity and postural rehabilitation protocols. The objective of the experimental trial was to compare the performance of two different variants of muscle stretching, highlighting for each one the regions of the posterior kinetic chain (lumbar region, gluteus muscles, hamstrings) most affected by the exercise. The data for the analysis was provided by the subjects, which reported on a specific Body Chart the localization of the stretching sensation.

The first variant (stretching A) is the generally accepted practice that is found in the literature, while the second (Stretching B), is the experimental suggested procedure, which adapts the execution of the exercise based on biomechanical reasoning, in order to focus the stretching sensation on the hamstrings muscles, decreasing the stress in the lumbar region.

MATERIAL and METHODS: Sample of 161 subjects, 75 men and 86 women, aged between 20 and 80 years old with different lifestyles and subject to well defined exclusion criteria (prosthesis, artificial implants, crippling arthritis, flare – up pain, recent surgical procedures).

Stretching A: Subject with lower limb in stretched position and in neutral rotation, knee locked in extended position and popliteal fossa in contact with the hard surface and upper arm stretched forward (Open Kinetic Chain).

Stretching B: Subject with lower limb in neutral position, knee with approximately 18° of feeble bending (variable depth, compact rolls in various size, behind popliteal fossa). The software Pain-drawing was employed for the analysis of the stretching sensation felt by each subject.

The method consists in using a tablet stylus (Stylus Pen Bamboo) to highlight, through a specific Body Chart displayed on an iPad, the localization of the stretching sensation and the single point most affected by the stretching exercise. The leg on which to perform the test was selected through a randomized standardization extraction.

RESULTS: the color RED identifies the area most frequently recognized as affected by the stretching sensation. Such region corresponds to the hamstrings, which were highlighted by the subjects in the following percentages: exercise A: M 32% (24 Soggetti) - F 34% (30 Soggetti) - tot 33.5% (54 Soggetti su 161); exercise B: M 41% 31 (Soggetti) - F 35% (30 Soggetti)- tot 38% (61 Soggetti su 161). A smaller percentage of subjects, which falls under the color BLUE, also felt the stretching sensation localized in the gluteus, lumbar and back region when performing exercise A.

Notably, the results show that the same area has not been affected when the subjects performed exercise B.

CONCLUSIONS: based on the results of the trial, both variants A and B exhibit the same effectiveness in the stretching of the posterior kinetic chain muscles of the lower limbs. However, the analysis of summary Body Charts show that variant A, with the knee locked in extended position (pretension of hamstrings muscles), and with the arm stretched forward, (creating a mechanical disadvantage), also interests the back and lumbar region with possible overstretch, resulting from the open kinetic chain of aa.ss and the locked position of the pelvis, due to the extension of the knee.

Exercise B, the experimental procedure, modifying the starting position of the knee and placing the hands face down, (C.K.C.), avoids both the pre-tension of the hamstrings and the lever created by the arms stretched forward, focusing the stretching sensation on the hamstrings muscles and gastrocnemius and affecting only marginally the lumbar region and never the back region. This appears particularly relevant for the prevention of lower back pain and for situation when the stretching of the posterior kinetic chain is performed as a cool-down following physical activity or for rehabilitation purposes.

REFERENCES

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