Starting double- and triple-support pulls in mas-wrestling: skeletal muscle electrical activity rating EMG tests and analysis

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Background. Success in the modern mas-wrestling sport competitions depends on the specific technical and tactical skills, with the starting pulls generally classified into the triple- and double-support ones – that mean the preferred starting positions. The individual starting preferences are believed to be dictated by the fine biomechanics, muscle group power and fitness and specific priority goals of every bout. It is not unusual that an individual standard starting posture heavily contributes to the competitive success [1, 3, 6, 7].

The starting pull and potential immediate advantage it generates is secured by the lead muscle groups of the upper and lower limbs and trunk – conditional on the perfect harmony and coordination of skeletal muscle efforts for the highest efficiency of the muscle contraction process [2, 3, 8]. It should be emphasized, however, that the sport is still in need of the key muscle group performance rating studies and analysis, with a special priority to the starting triple- and double-support pull versions applied in mas-wrestling bouts.

Objective of the study was to run electromyographic (EMG) tests of the key muscle group electrical activity in the starting triple- and double-support pull versions with a comparative analysis.

Methods and structure of the study. We made, for the purposes of the study, EMG tests of the key muscle groups mobilized in the starting triple- and double-support pull versions in the mas-wrestling bouts using a computerized EMG test system [4, 6, 5]. The muscle group electrical activity was tested using a standard Muscle Lab system made by Ergotest Technology Co. The computerized test system of a modular telemetric design may be configured and customized for specific research goals. The MuscleLab test system includes a 8-channel electromyograph; a 1D/ 2D/ 3D goniometer module; dynamometric 2-channel module rated for 100kg, 300kg and 500kg maximums; a connector port for the power platform; chronometric module with up to 8 optic couples; a contact mat for IR tests; biaxial accelerometer; and a linear movement sensor with an inertial coil to fix positions and linear movement speeds. In practical EMG tests, we used disposable surface electrodes fixed on skin 2cm afar. We tested the trunk/ lower limb muscle group electrical activity in the starting triple- and double-support pull versions of the mas-wrestling bouts. More specifically, we tested the electrical activity of the trunk trapezius muscle, latissimus dorsi, and lumbar extensor muscles; and the lower limb quadriceps, biceps and gastrocnemius.

Results and discussion. Given on Figure 1 hereunder are the starting triple- and double-support pull test data that made it possible to detect the lead muscles in the movement sequence.

Figure 1. *EMG test data for the starting triple- and double-support pull movement sequence*

In the horizontal pull move, tested with the highest amplitudes, integrated electrical activity and EMG frequency was the trapezius muscle (± 495.36 μVs; 124.4±8.09 Hz) – that is the lead trunk muscle in the case. The latissimus and lumbar extensor muscles were tested with the lower electrical activity. It should be noted that the trunk muscles were mobilized first for the pull and relaxed the last thereafter.

Furthermore, we tested the lower limb muscle electrical activity in the starting triple-support pull sequence to find the biceps femoris electrical activity lower than in the trunk muscles albeit higher than in the other lower limb muscles. The lead and assisted muscles were tested to mobilize sooner and stay active later in the starting triple-support pull sequence than the other muscles: see Figure 1.

Then we tested the above muscle electrical activity in the starting double-support pull sequence to find the lead muscle group: see Figure 2. We found the static posture-specific angular characteristics of the trunk, lower limbs and forearms, plus the knee extension range varying from 100° to 180° (see Figure 2) with active contraction of the trapezius muscles.

Tested with the highest amplitudes, integrated electrical activity and EMG frequency in the starting double-support pull sequence was the radial hand flexor (332.87±95.6 μV; 1413.5±495.36 μVs; 124.4 ± 8.09 Hz, respectively) ranked as the lead muscle in the case. It should be noted that the triceps brachii and biceps femoris were tested with the lower electrical activity albeit higher than in the other muscles (see Figure 2). The lead and assisted muscle group were tested to mobilize sooner and stay active later in the starting double-support pull sequence than the other muscles.

Figure 2. *EMG test data for the starting double-support pull movement sequence*

Therefore, the specific horizontal pull execution technique (triple- and double-support pulls) was found to mobilize and load somewhat different muscle groups and bodily elements. As demonstrated by the above study data, the triple- and double-support pulls mobilize different muscle groups and skeletal muscles due to the natural differences, benefits and drawbacks of every pull technique plus the individual preferences of the athletes.

Conclusion. Presently the starting triple- and double-support pulls are the key pull techniques in the modern mas-wrestling sport of special benefits for competitive success, with both of the techniques mobilizing specific and somewhat different muscle groups as verified by the muscle electrical activity test rates yielded by the EMG tests, with a range of individual muscle group mobilization and control differences. On the whole, the study data and analyses showed the individual choice of a starting triple- and double-support pull technique being largely dictated by the lead muscle group power fitness and control rates and the specific tactical goals in one or another bout.

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Abstract

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