

# EFFECTS OF A LIGHTER DISCUS ON SHOULDER MUSCLE ACTIVITY IN ELITE THROWERS, IMPLICATIONS FOR INJURY PREVENTION

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## ABSTRACT

**Background:** Performance in the discus throw requires high forces and torques generated from the shoulder of the throwing arm, making shoulder muscles at risk of overuse injury. Little is known on muscle activation patterns in elite discus throw.

**Hypothesis/Purpose:** The purpose of this study was to compare the body kinematics and muscle activation patterns of arm and shoulder muscles involved in discus throwing when using discs of different mass (1.7 kg vs 2.0 kg). It was hypothesized that the use of a lighter discus would modify the activation of the shoulder musculature compared to a standard discus.

**Study design:** Case-control laboratory study

**Methods:** Seven male elite discus throwers performed five throws using a standard discus (STD, 2.0 kg) and five throws using a lighter weight discus (LGT, 1.7 kg). Surface EMG was recorded for the biceps brachii (BB), deltoideus anterior (DA), deltoideus medialis (DM), clavicular head of the pectoralis major (PM), latissimus dorsi (LD), and trapezius medialis (TM). Three-dimensional high-speed video analysis was utilized to record discus speed and identify the different temporal phases of each throw from the preparation phase (P1) to the delivery phase (P5).

**Results:** The EMG activation of LD lasted longer ( $p < 0.01$ ) in P1 and was initiated later in P5 with the LGT discus compared to STD. In P5, the EMG intensity of BB decreased ( $p = 0.02$ ) with LGT (%EMGmax =  $50.4 \pm 49.6\%$ ) compared to STD ( $64.8 \pm 77.9\%$ ) and the activation of PM increased ( $p < 0.01$ ) with LGT ( $86.2 \pm 40.3\%$ ) compared to STD ( $66.2 \pm 26.9\%$ ). The discus speed at release was increased ( $p = 0.04$ ) by using the LGT discus ( $20.62 \pm 0.75\text{m}\cdot\text{s}^{-1}$ ) compared to STD ( $19.61 \pm 0.57\text{m}\cdot\text{s}^{-1}$ ). The throwing distance was also increased ( $P < 0.01$ ) with the LGT ( $43.1 \pm 4.3\text{m}$ ) discus compared to STD ( $39.4 \pm 3.4\text{m}$ ).

**Conclusion/Clinical relevance:** A lighter discus could be used by elite athletes in training to add variability in muscle solicitation and thus limit the overload on certain muscles of the shoulder region. These results may have implications regarding lowering the risk of injury in discus throw.

**Level of Evidence:** Level 3

**Keywords:** biceps brachii, electromyography, discus throwing, performance, training, upper limb

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