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ANALYSIS OF ACCELERATION OF SELECTED BODY SEGMENTS DURING LONG AND SHORT FIREARM SHOTS

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Shooting is a sport that is becoming more and more popular every year. It is popular both in sports and defense contexts. The key parameter assessing the effectiveness of firearm handling is accuracy. It is influenced by many factors, from which one of the most important is the movement of the body when shooting. Despite the high importance of shot accuracy in both the civilian and military sectors, there have not been many biomechanical studies assessing the relationship between the accelerations of body segments and hitting the target accurately with a firearm. The aim of the study is analysis of acceleration of selected body segments during long and short firearm shots.

The group of participants on whom kinetic tests were carried out consists of 20 people, including 18 men and 2 women, aged 18 to 50. The research group was divided into professionals, people experienced in using firearms, and amateurs who had no previous contact with shooting. The research was conducted using the Noraxon MyoMotion motion analysis system. Participants fired 10 shots during which the acceleration of body elements was measured using inertial sensors placed on the subject's head, pelvis, hands, C7 and T12 vertebrae. Then, the magnitudes of accelerations recorded at the moment of shooting were compared for professionals and amateurs.

The research results show large differences in acceleration between professionals and amateurs, both when shooting with long and short firearms. The highest acceleration values for both research groups were recorded by sensors placed on the hands. Moreover, research shows that the left hand of professionals accelerates much faster when shooting with short weapons than that of amateurs, while the C7 and T12 vertebrae of professionals are more stable. This may be due to the weak grip of inexperienced shooters, which results in less compensation of recoil by the left hand. In the case of long guns, inertial sensors recorded higher accelerations in professionals in the head, vertebrae and pelvis, and lower accelerations in both hands. The reason for this may be the experience of advanced shooters in counteracting recoil by firmly pressing the stock of the weapon to the shoulder, as a result of which a large part of the energy of the shot is transferred to the shooter's torso. Amateurs, on the other hand, focus on a strong hand grip and not on transferring the recoil to the arm and torso, as a result of which the acceleration of their hands is greater and the acceleration of head, pelvis and vertebrae is smaller.