THE INFLUENCE OF EXTRA LOAD ON TIME AND FORCE STRUCTURE OF VERTICAL JUMP

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INTRODUCTION: Extra load is very often used in the training for development of explosive strength. Some research works are focused on a problem of take-off activity in relationship to extra load (Nelson & Martin, 1985; Bosco et al., 1984 and others). The main aim of this study was to find how the extra load influences time and force curve of the vertical jump.

METHODS: The analysis of the ground reaction force during vertical jump (Kistler force plate 9281CA, BioWare v3.2.6) using procedure described in Vaverka (2000) provided us with times of preparation, braking and accelerating phases and the total time of take-off duration, average force in braking and accelerating phases, the peak force in accelerating phase and braking and accelerating force impulses. The height of jump was computed from accelerating force impulse and body and external load weight. Two groups of university students (men, n = 18; women, n = 18) were asked to execute counter-movement vertical jump with arms excluded in four variants: without load and with extra load equal to 10%, 20%, and 30% of their body weight. Resulting 17 variables were statistically analyzed (ANOVA, Statistica v8).

RESULTS: We found the same tendency in results for both men and women. Statistically significant difference was found only in one variable – the height of jump, which decreased with increasing size of extra load (men: 38.3 – 34.4 – 30.9 – 27.6 cm, women: 29.7 – 26.0 – 23.3 – 20.2 cm). We also found slight and statistically non-significant increase in the total duration of take-off (men, 0.98–1.05 s, women 0.78-0.81 s) and in accelerating force impulse (men, 212–233 Ns, women 140–150 Ns).

DISCUSSION: Only small and statistically not significant differences in analyzed time and force variables of the Fz(t) were found. Increasing load (human body and external load) in combination with almost identical accelerating force impulses produced in different variants of jumps resulted in significantly decreasing height of jump.

CONCLUSION: Increased load resulted in small and statistically non-significant changes in measured time and force variables, except for the height of jump. We found only small extension in the total time of the take-off caused by longer time of braking and accelerating phase, and in the magnitude of accelerating force impulse. The research proved that increasing external load up to 30% of body weight does not significantly change the force-time structure of the vertical jump.

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