

Abstract

Comparison between bodyweight squat and lunge exercises on Heart Rate, Muscle Oxygen Saturation and Perceived Exertion responses

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Bodyweight Squat and Lunge exercises are strongly focused on the lower limbs, differing among them in symmetry of movement. Several different task constraints related to technical variations or training targets, such as the type of surface, type of contraction, and range of motion, can elicit different acute physiological responses (Miranda-Fuentes et al., 2021). This study aimed to compare the effects of six Lunge and Squat variations

on oxygen saturation (SmO₂) in the vastus lateralis (VL) muscle, heart rate (HR) response, and perceived exertion (RPE_c and RPE_m, respectively) in cardio and muscle. Seventeen healthy adults participated in this study (age=25.6±2.8yrs; body-mass = 74.9 ± 9.0kg; height = 175 ± 7cm; Body Mass Index = 24.7 ± 4.9kg/m²; VL skinfold = 13.2 ± 4.8mm). A familiarisation session for all exercise variations was conducted, followed by two experimental sessions on separate days, where the six variations were held in random order for 90 seconds and 5 5-minute rest (cadence 40-60bpm). Variations were chosen to include unstable (squat Terra-Core | side-lunge Terra-Core), reactive (squat Jump | Jumping lunge), single-leg (Pistol squat | Bulgarian split squat), isometric (Wall squat | lunge), and range-of-motion exercises (Deep squat | Walking lunge and Uneven squat | Cross lunge). The VL SmO₂ percentage (Moxy Fortiori Design, Hutchinson, USA) and HR (Garmin HRM3-SS) were continuously measured during sessions and RPE (Borg 6-20) was registered immediately after each variation (Gómez-Carmona et al., 2020). Repeated measures ANOVA with Bonferroni's correction revealed no differences in the VL SmO₂ between exercise variations ($F_{[11.99]}=2.7$, $p=0.030$, $\eta^2=0.061$) except on Jumping vs. Crossed lunges ($p=0.049$). HR ($F_{[11.88]}=6.27$, $p<0.001$, $\eta^2=0.198$) revealed differences between variations, specifically with the reactive ones. However, no differences were found between the squat and lunges of the same category in RPE_c. Higher RPE was found in reactive lunge and squat (RPE_c 15.5±2.7 and 15.9±1.5, and RPE_m 18.4±1.4 and 17.9±2.0). Lunge vs. squat isometric variations revealed no difference in SmO₂ and reported similar RPE_c (13.2±2.9 and 13.0±2.8) and RPE_m (17.0±3.2 and 16.2±1.6). Both reactive variations revealed higher RPE_m compared to other variations ($F_{[11.99]}=13.7$, $p<0.001$, $\eta^2=0.550$), and Crossed and Lateral lunge did not have differences with at least one of the reactive variations. Squat and lunge variations of the same category promoted similar responses in HR, while there were no significant

differences in VL SmO₂ in any variation of the different categories. Isometric variations promoted lower HR than RPE_c perceived by participants. Despite no differences in SmO₂, reactive variations were perceived by participants with higher RPE_m, and unstable variations with lower RPE_m, regardless of the exercise.

Keywords: bodyweight exercise; heart rate; muscle oxygen saturation; perceived exertion

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