

Intensity-dependent effect of body tilt angle on calf muscle fatigue in humans

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Body tilt angle affects the fatigue of human calf muscle during intermittent contractions performed at a relatively high force (70% Maximum Voluntary Contraction, MVC); but the range of forces across which this effect occurs is not known. To help determine this, 14 male subjects performed a randomised series of exercise tests that consisted of isometric calf muscle contractions (2 s duration) performed intermittently (4 s rest) for up to 20 minutes or until failure, whichever came first. Seven subjects (Group 1) performed eight tests at two body tilt angles (0 and 67°) and four contractile forces (30, 40, 50 and 60% MVC). The other seven subjects (Group 2) performed four tests at these same tilt angles at two higher forces (80 and 90% MVC). MVC was assessed immediately prior to and during exercise at each fifth (Group 2) or tenth contraction (Group 1). The linear rate of decline in MVC was used to represent fatigue. MVC prior to each exercise test was not affected by tilt angle. The mean MVC responses prior to all tests in the supine versus inclined positions were 1514 vs 1558 N (Group 1) and 1343 vs 1318 N (Group 2) respectively. Mean (SD) responses of fatigue ($N \cdot s^{-1} \times 10^{-2}$) are shown in the table. For Group 1 there was a significant interaction between posture and intensity (ANOVA $p < 0.05$) such that fatigue was relatively lower in the inclined position only at higher contractile forces. For Group 2 there was a main effect of posture such that fatigue was lower in the inclined position at 80 and 90% MVC. These data suggest that the postural effect on muscle fatigue is limited to moderate and high contractile forces, at least for the exercise conditions studied here.

Force	30% MVC (Group 1)		40% MVC (Group 1)		50% MVC (Group 1)		60% MVC (Group 1)		80% MVC (Group 2)		90% MVC (Group 2)	
Angle	0°	67°	0°	67°	0°	67°	0°	67°	0°	67°	0°	67°
Mean (SD)	-7.7 (6.0)	-7.7 (6.0)	-27.1 (17.0)	-15.6 (6.0)	-37.8* (38.0)	-13.2 (9.0)	-81.4* (81.0)	-45.1 (36.0)	-116.0* (78.0)	-66.0 (29.0)	-157.0* (89.0)	-97.0 (61.0)

* significant difference between tilt angles (Tukey's Test: $p < 0.05$)