

Metabolic and Cardiovascular differences between an Eccentric, Concentric, and Traditional Resistance Exercise Training Session

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Abstract

The reduced metabolic cost of isolated eccentric contractions compared to concentric contractions is well established. However, the net impact of this difference across an entire session of resistance exercise has yet to be determined. Thus, the purpose of this investigation was to determine the extent to which metabolic and cardiovascular stress varied between training sessions comprised only of eccentric, concentric or traditional resistance exercises. Twelve subjects completed a traditional (TRAD), concentric (CON), and eccentric (ECC) full-body resistance workout comprised of 6 upper and lower body exercises. Resistance was set at 65% of their 1 repetition max and mechanical work was matched across conditions. Oxygen consumption (VO_2), respiratory exchange ratio (RER), heart rate (HR), mean arterial pressure (MAP), and blood lactate were recorded throughout the exercise sessions. Both the TRAD ($9.26 \pm 1.83 \text{ ml/kg/min}$) and CON ($10.03 \pm 1.63 \text{ ml/kg/min}$) conditions resulted in greater VO_2 values when compared to the ECC ($6.67 \pm 1.25 \text{ ml/kg/min}$) condition. HR and MAP values were 46% and 4% greater in CON compared to that of ECC conditions. Furthermore, RER during CON (1.00 ± 0.03) and TRAD (1.03 ± 0.04) were greater than during ECC (0.88 ± 0.09). Blood lactate was also greater in CON ($8.9 \pm 1.7 \text{ mM}$) and TRAD ($9.0 \pm 3.0 \text{ mM}$) compared to ECC ($2.5 \pm 1.9 \text{ mM}$) ($p < 0.0001$) conditions. These results indicate that, despite similar mechanical work, the metabolic and cardiovascular demand across resistance training is greater when that

session is comprised of only traditional or concentric exercise compared to eccentric exercises. These results have implications for the exercise prescription of individuals with metabolic and cardiovascular.