

Cardiorespiratory Responses during 2-Person CPR using Two Assisted CPR Devices versus Manual CPR

RICHARD VEGA II, WILLIAM H COOKE, KLARISSA SOSA, ELIZABETH VEGA, and DONOVAN L FOGT

Integrative Cardiopulmonary and Autonomic Performance Laboratories; Department of Kinesiology, Health, and Nutrition; University of Texas at San Antonio; San Antonio, TX

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Mentors: Donovan L Focht, donovan.focht@utsa.edu; William H Cooke, william.cooke@utsa.edu

ABSTRACT

Active Compression-decompression-CPR (ACD-CPR) requires rescuers to perform work during both phases of CPR. ACD-CPR provides active pre-loading of a patient's heart with venous return as well as enhanced stroke volume during resuscitation. Prolonged, one-person CPR is exhausting and associated with decayed CPR quality over time. Active compression-decompression-CPR (ACD-CPR) requires the rescuer to actively work during both phases of CPR. We evaluated the metabolic cost of manual CPR (M-CPR), ACD-CPR1, and ACD-CPR2 (with adhesive pad) during a 10-min resuscitation period. We hypothesized that the metabolic cost for the devices would be similar to M-CPR. Twenty (10 female) participants (23.5±3.5y, 165.8±25.6cm, 72.5±12.2kg) completed 3 randomized trials with performance feedback by investigators. Expired air was analyzed for estimations of metabolic cost via indirect calorimetry. Participants rested for 10 minutes before the baseline data collection followed by 10 min of CPR to simulate one-person CPR. Treatment effects were observed for VO₂, METS, VCO₂, RR, RQ, blood lactate, SBP, and RPE. No such effects were observed with HR and DBP as the observed condition differences for HR and DBP were not significantly different from each other. Blood lactate and SBP were significantly higher using ACD-CPR1 compared to M-CPR and ACD-CPR2. Although a trend for elevated DBP was observed with ACD-CPR1, this was not significantly different. RQ values for the ACD-CPR1 device (1.0 ± 0.0) were significantly higher than the RQ values for M-CPR (0.9 ± 0.0) and ACD-CPR2 (0.9 ± 0.0). Assisted CPR using the ACD-CPR1 device is more stressful to the cardiorespiratory system as reflected by the higher SBP compared to the ACD-CPR1 or standard M-CPR. Metabolically, the ACD-CPR1 required more VO₂ and elicited higher RQ, RPE, and lactate values during 10-min simulated one-person resuscitation compared to M-CPR and ACD-CPR1. However, the ACD-CPR2 cardiorespiratory results were similar to that of M-CPR, despite the latter method's higher rate of compressions (110/min) and passive decompressions.