

Metabolic Responses of Two Assisted CPR Devices versus Manual CPR during 1-Person CPR

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ABSTRACT

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, HR, RR, blood lactate, and RPE. No such effect was observed for RQ, SBP, or DBP. VO₂ (ml/kgBW/min) was significantly higher with ACD-CPR1 (17.8±1.4) vs. M-CPR and ACD-CPR2 (15.9±0.9 and 14.2±1.1, respectively). Metabolic equivalent (MET) was significantly lower with ACD-CPR2 (4.1±0.3) vs. M-CPR and ACD-CPR1 (4.7±0.3 and 5.1±0.4, respectively). All three groups' blood lactate data differed significantly with ACD-CPR1 > M-CPR > ACD-CPR2. The RR required by the ACD-CPR1 during a 10 min CPR simulation is significantly higher than the ACD-CPR2 and M-CPR. No group differences were observed for RQ, SBP, or DBP. CPR performance metrics were averaged over the 10-min resuscitation period. RPE was significantly higher following ACD-CPR1 compared to both M-CPR and ACD-CPR2. The metabolic work required by the ACD-CPR2 during 10-min simulated one-person resuscitation (80/min) is far less than the ACD-CPR1. However, the ACD-CPR2 metabolic cost is similar to that of M-CPR, despite the latter method's higher rate of compressions (110/min) and passive decompressions.