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Purpose: Guideline-compliant cardiopulmonary resuscitation (CPR) performance can be achieved with training and use of real-time feedback. Kinematic differences are reported between experts and novices in various motor tasks. The aim of this pilot study was to investigate differences in kinematics between professional and lay rescuers during CPR performed on a manikin with and without feedback.

Methods: Professional (n = 5) and lay rescuers (n = 11) performed two minutes of continuous chest compressions on a manikin for two trials. Real-time CPR feedback provided by a defibrillator was disabled in the first trial and enabled in the second. CPR pads containing an accelerometer were used to calculate individual compression characteristics. Participants were instrumented for electromyography (EMG) and inertial motion capture and a motion capture marker was placed on the top hand. Paired and independent-sample t-tests and Pearson correlations were conducted in STATA 15.1.

Results: CPR feedback increased compression depth in lay rescuers ($p < 0.05$) to achieve guideline compliance. Lower bilateral hip range of motion (ROM) was recorded in lay rescuers compared with professionals without feedback ($p < 0.05$), but hip ROM was increased in lay rescuers with feedback enabled ($p < 0.05$). Hip ROM was associated with compression depth on both right ($r = 0.61$, $p < 0.01$) and left sides ($r = 0.65$, $p < 0.01$) for all rescuers. Greater left shoulder flexion was measured in lay rescuers both with ($p < 0.05$) and without feedback ($p < 0.05$). Lower extremity muscle coactivation indexes (CI) indicate greater hip extensor activity in professionals with feedback on both left (1.42 ± 0.17 vs. 0.87 ± 0.12, $p < 0.05$) and right sides (1.33 ± 0.16 vs. 0.99 ± 0.07, $p < 0.05$).

	Feedback	Depth (cm)	Rate (CC/min)	L Hip ROM (degrees)	R Hip ROM (degrees)	L Should Max (degrees)	R Should Max (degrees)
Lay rescuers	disabled	4.47 ± 0.26[a,b]	121.37 ± 8.66	11.48 ± 0.89[a,b]	11.65 ± 0.91[a,b]	57.54 ± 2.80[a]	58.89 ± 1.74
	enabled	5.36 ± 0.20[b]	113.53 ± 2.69	14.06 ± 1.06[b]	14.46 ± 1.30[b]	57.77 ± 3.67[a]	58.45 ± 3.23
Professionals	disabled	6.73 ± 0.34[a]	118.76 ± 7.52	16.16 ± 1.94[a]	16.76 ± 2.10[a]	43.40 ± 4.05[a]	53.85 ± 1.80
	enabled	6.01 ± 0.13	112.78 ± 4.17	14.00 ± 1.65	14.25 ± 1.57	43.13 ± 2.23[a]	49.95 ± 4.55

Data reported as mean ± standard error

[a]significant difference between lay rescuers and professional rescuers with same feedback conditions ($p<0.05$).

[b]significant difference between feedback enabled and disabled within groups ($p<0.05$).

Conclusions: Real-time CPR feedback facilitated guideline-compliant compression performance and differences between professional and lay rescuers in body position and muscle activation were identified. The importance of these kinematic differences on rescuer fatigue and chest compression-generated blood flow should be investigated.