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Abstract 482: Differences in Ground Reaction Forces and Chest Compression Release Velocity in Professional and Lay Rescuers With and Without the Use of Real-Time CPR Feedback

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Abstract

Purpose: Chest compression release velocity (CCRV) has been associated with survival and favorable neurological outcome after cardiac resuscitation. Both complete chest release and high CCRV contribute to improved venous return during CPR. Differences in compression forces delivered by professional and lay rescuers are reported, which may contribute to differences in CCRV. The aim of this pilot study was to investigate differences in ground reaction force (GRF) and CCRV between professional and lay rescuers during CPR performed on a manikin with and without real-time feedback.

Methods: Professional (n = 5) and lay rescuers (n = 11) performed two minutes of continuous compressions on a manikin positioned over a force plate for two trials. 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. Relative maximum and minimum GRFs were calculated for each compression cycle and averaged over each trial. Paired and independent sample t tests and Pearson correlations were conducted in STATA 15.1.

Results: CCRV was higher in professionals vs. lay rescuers with feedback disabled and enabled ($p<0.05$). Professionals had greater maximal and lower minimum forces than lay rescuers without feedback ($p<0.05$), though there were no differences between groups with feedback enabled (Table 1). CCRV was associated with minimum force ($r = -0.63$, $p<0.01$) and force range ($r = 0.78$, $p<0.01$) in all rescuers. Analysis of GRFs by CCRV for all rescuers indicated lower force minimum (9.71 + 3.16 N, $p<0.05$) with CCRV >400 mm/s in comparison to CCRV 300-400 mm/s (39.73 + 8.91 N) and CCRV 200-300 mm/s (63.82 + 16.98 N).

Conclusions: CPR feedback attenuated differences in GRF between professional and lay rescuers. CCRV was greater in professionals and was associated with measures of GRF, and thus may serve as an indicator of both velocity and amount of chest release.

Table 1: Chest compression characteristics and ground reaction forces measured by force plate

	Feedback	Depth (cm)	Rate (CC/min)	CCRV (mm/s)	Force Max (N)	Force Min (N)	Force Range (N)
Lay rescuers	disabled	4.47 ± 0.26*,^	121.37 ± 8.66	327.10 ± 17.91*	580.62 ± 31.41*,^	51.67 ± 10.68*	529.09 ± 33.50*,^
	enabled	5.36 ± 0.20^	113.53 ± 2.69	375.46 ± 23.52*	673.75 ± 29.42^	30.64 ± 10.15	643.13 ± 28.72^
Professionals	disabled	6.73 ± 0.34*	118.76 ± 7.52	529.56 ± 15.64*	761.82 ± 60.85*	8.80 ± 4.31*	753.04 ± 58.46*
	enabled	6.01 ± 0.13	112.78 ± 4.17	466.35 ± 18.23*	665.43 ± 36.74	10.40 ± 5.40	655.04 ± 33.13

Data reported as mean ± standard error

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

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