

## Development of an accelerometer device with voice prompts to improve the quality of chest compressions delivered by untrained rescuers : a usability study

Isabelle Claus, Eline Naert, Paul A. Calle, Koenraad G. Monsieurs

Emergency Department, Ghent University Hospital, De Pintelaan 185, 9000 Ghent, Belgium

**Introduction:** The PocketCPR (Bio-Detek, US) is a battery driven device developed for trained rescuers to improve the quality of CPR by measuring compression depth using accelerometer technology and by prompting for ventilation. We developed and tested a new algorithm with voice prompts (VP) to improve the quality of chest compressions delivered by untrained rescuers.

**Methods:** Chest compressions skills of twelve lay participants (mean age 43 years, range 22-66) were recorded for one minute on a computerized CPR manikin (Laerdal, Norway). After one minute of rest, they performed chest compressions for another minute using a silenced PocketCPR device. An accelerometer mounted into the manikin (Wii remote, Nintendo, US) was connected by Bluetooth with a netbook with software activating the following VPs according to a predefined algorithm: 'Place the device between the victim's nipples, in the middle of the chest'; 'Place one hand on the other, on top of the device'; 'Press hard with each beep, straight downwards'; 'Compressions not deep enough, push harder'; 'Compressions too deep, push less hard'; 'Compressions too slow, push faster, follow the beep'; 'Compressions too fast, push slower, follow the beep'; 'Good compressions, continue'. The manikin recorded depth, rate, release, position of chest compressions and hands off time. Results without and with VPs are expressed as median [IQR], reported per minute and compared using the paired Student t-test.

### Results:

	without VPs	with VPs	P-value
<b>Compression depth (mm)</b>	32 [18-43]	39 [33-44]	0.099
<b>Number of compressions with adequate depth (38-51 mm)</b>	35 [0-71]	47 [26-79]	0.340
<b>Number of compressions with depth &gt; 38 mm</b>	40 [0-80]	54 [26-91]	0.186
<b>Compression rate</b>	80 [56-88]	100 [97-101]	0.050
<b>Number of compressions (per min)</b>	67 [43-86]	95 [91-101]	0.002
<b>Compressions with incomplete release</b>	0 [0-0]	2 [0-2]	0.112
<b>Average hands off time (sec)</b>	1 [0-2]	2 [0-3]	0.205
<b>Number of correct compressions (adequate depth, complete release, correct position)</b>	10 [0-3]	32 [1-43]	0.011

With VPs, 6/12 participants did not achieve an average compression depth of 38-51 mm.

**Conclusion:** Our results show that the new algorithm significantly improved the number of correct compressions per minute delivered by untrained individuals, but still half of the participants did not receive sufficient mean compression depth.

Perspectives: Further improvements in VPs and algorithm will aim at achieving higher compression depth in untrained rescuers.

Key words: accelerometer, chest compression, quality