

***Comparison of Bystander Fatigue and
CPR Quality when Using the New 30:2
versus the Old 15:2 Chest Compression
to Ventilation International Guidelines:
A randomized cross-over trial***



Ottawa, November 2006

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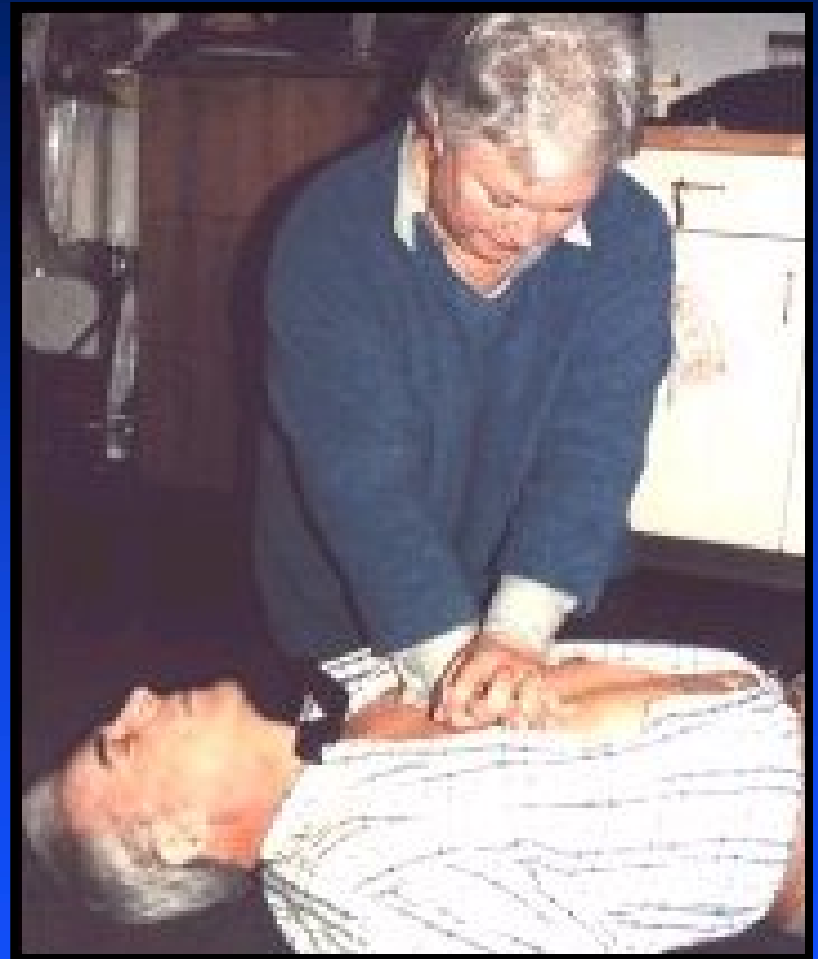
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**Funding Opportunity for
Department of Emergency Medicine
Academic Activities**

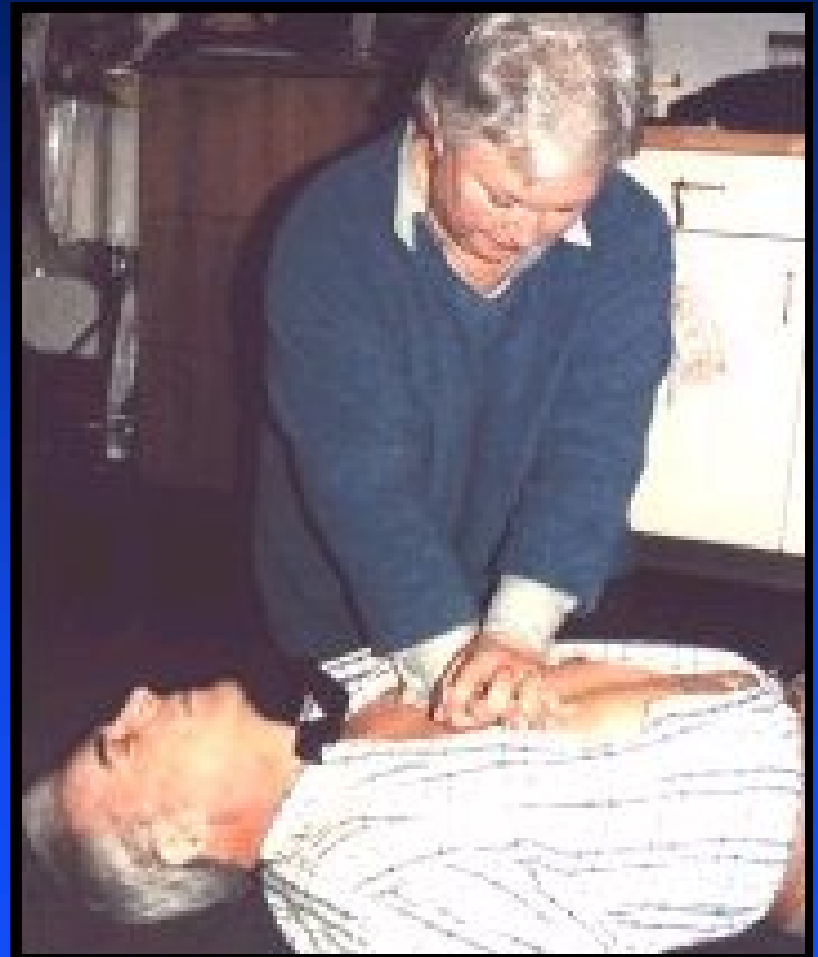
Background

- Cardiac arrest is the #1 cause of death in Canada
- 85% of cardiac arrests occur at home
- Classic victim is a 69 year old male
- Most bystanders are spouses of 69 year old males!



Background

- Bystander CPR rate is 15% in Ontario
- Overall survival to cardiac arrest is 5%
- Bystander CPR can increase survival for cardiac arrest victims by 3-4 times



Background

- International Guidelines have recently changed the CPR ratio from 15:2 to 30:2
- Minimize interruptions and increase the number of compressions
- Scientific evidence derived from animal data



Objectives

To measure CPR quality and bystander fatigue after 5 minutes of CPR using the 30:2 ratio compared to the 15:2 ratio in a population aged 55 or greater



Methods

- Design: Randomized cross-over study
- Population:
 - Aged 55 or greater
 - No physical limitation, no disease precluding their ability to safely perform CPR
 - Validated Frailty Score of 3 or less

Canadian Study of Health and Aging Clinical Frailty Scale

- 1 *Very fit* — robust, active, energetic, well motivated and fit; these people commonly exercise regularly and are in the most fit group for their age
- 2 *Well* — without active disease, but less fit than people in category 1
- 3 *Well, with treated comorbid disease* — disease symptoms are well controlled compared with those in category 4
- 4 *Apparently vulnerable* — although not frankly dependent, these people commonly complain of being “slowed up” or have disease symptoms
- 5 *Mildly frail* — with limited dependence on others for instrumental activities of daily living
- 6 *Moderately frail* — help is needed with both instrumental and non-instrumental activities of daily living
- 7 *Severely frail* — completely dependent on others for the activities of daily living, or terminally ill

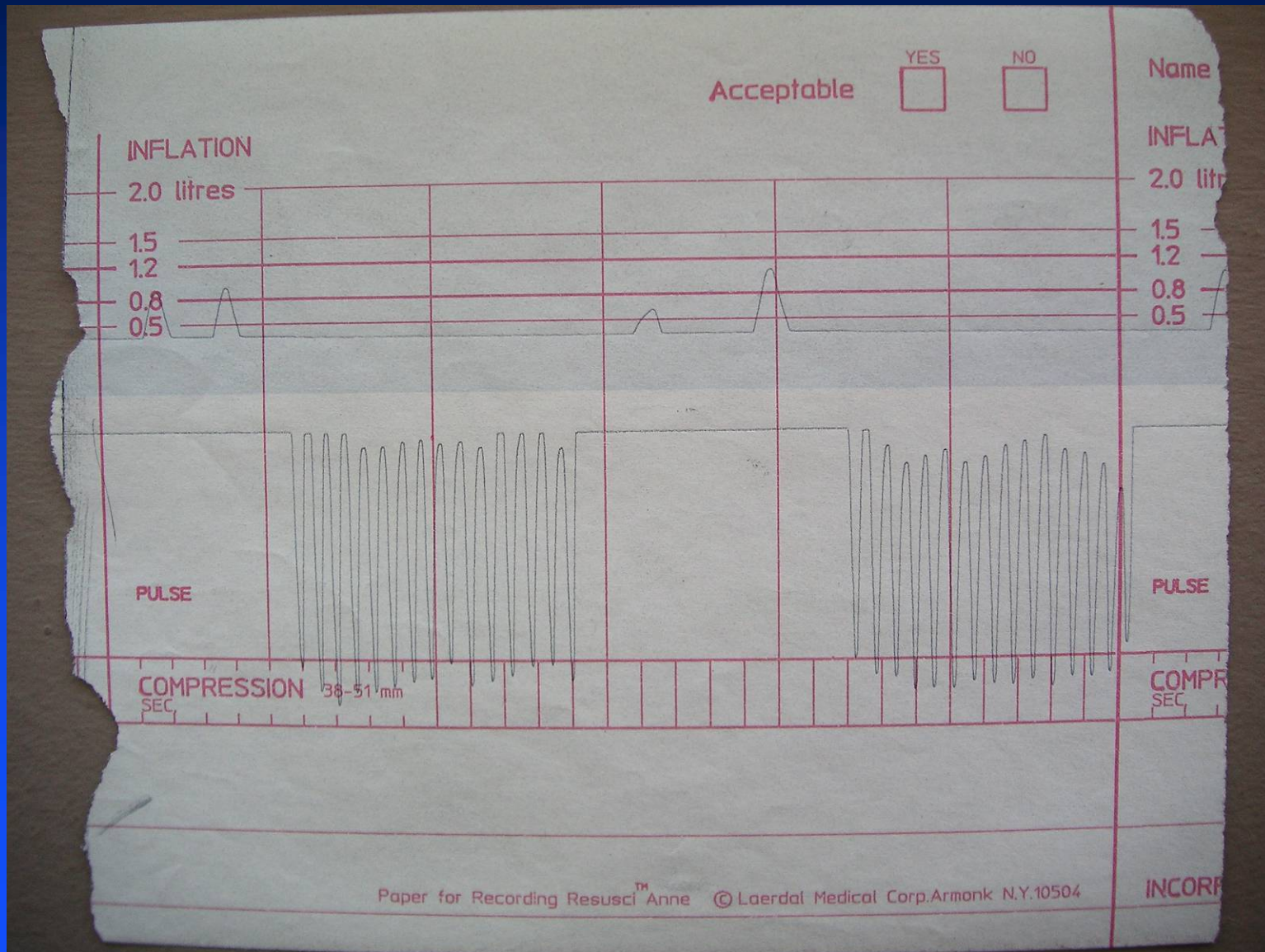
Methods

- Recruitment:
 - Kanata Seniors Center
 - Main court of The Ottawa Hospital
- After a supervised practice session:
 - Two 5-minute CPR sessions on a Recording Laerdal Resusci-Anne manikin
 - One using the 30:2 ratio, the other using the 15:2 ratio
- Blocked random assignment to a starting CPR ratio was concealed
- 5-minute rest period between each of the CPR sessions

Methods


- CPR quality measures:
 - Number of chest compressions per minute
 - Total number of chest compressions with adequate depth and release over 5 min
- Bystander fatigue measures:
(before and after each CPR session)
 - Heart rate (HR)
 - Mean arterial pressure (MAP)
 - Venous lactate levels (10 participants)
 - Validated Borg Rating of Perceived Exertion

Measure of CPR Quality



Validated BORG Scale

Échelle de Borg		Borg's Scale
très très facile	6	very, very light
	7	
très facile	8	very light
	9	
assez facile	10	fairly light
	11	
	12	
un peu difficile	13	somewhat hard
	14	
difficile	15	hard
	16	
très difficile	17	very hard
	18	
très très difficile	19	very, very hard
	20	



Methods

- Desired sample size:
 - 42 participants
 - 10 for lactate levels
- Data analysis:
 - Descriptive statistics
 - Paired t-test with 95% CI comparison of mean differences between paired groups
 - Mixed effect regression model for each minute of CPR over time
- We obtained institutional ethics approval

Participant Characteristics N=42

	All	Started with 15:2 (n=21)	Started with 30:2 (n=21)
Mean age	66.0	65.6	66.4
Gender (% female)	69.0	57.1	81.0
Mean BMI	26.4	25.9	26.8
Clinical Frailty Score			
1 (%)	47.6	52.4	42.9
2 (%)	42.9	38.1	47.6
3 (%)	9.5	9.5	9.5

Participant Characteristics N=42

	All	Started with 15:2 (n=21)	Started with 30:2 (n=21)
CPR training (%)	66.7	57.1	76.2
CPR experience (%)	19.0	9.5	28.6
Initial Borg score (mean)		8.6	9.4
Initial MAP (mean)		90.0	92.5
Initial HR (mean)		71.1	69.8
		(n=6)	(n=3)
Initial lactate (mean)		1.6	1.3

Paired T-Test Comparisons Between Ratios (Mean Differences)

	15:2	30:2	95% CI Mean diff.
Participant fatigue			
Borg score (n=42)	3.3	3.5	-0.2 - 0.8
HR (n=41)	10.7	12.2	-1.5 - 4.5
MAP (n=41)	4.5	6.0	-1.8 - 4.8
Lactate levels (n=9)	1.2	1.4	-1.1 - 1.4

Paired T-Test Comparisons Between Ratios (Absolute numbers)

	15:2	30:2	95% CI Mean diff.
CPR quality (n=38)			
Time/2 ventilations (sec)	6.7	7.6	-0.1 - 0.6
Compression rate/min	109.5	108.1	-3.9 - 1.2
Total # of cc/5 min***	306.1	368.1	69.5 - 87.7
Total # perfect cc/5 min	129.9	131.9	-18.9 - 22.9

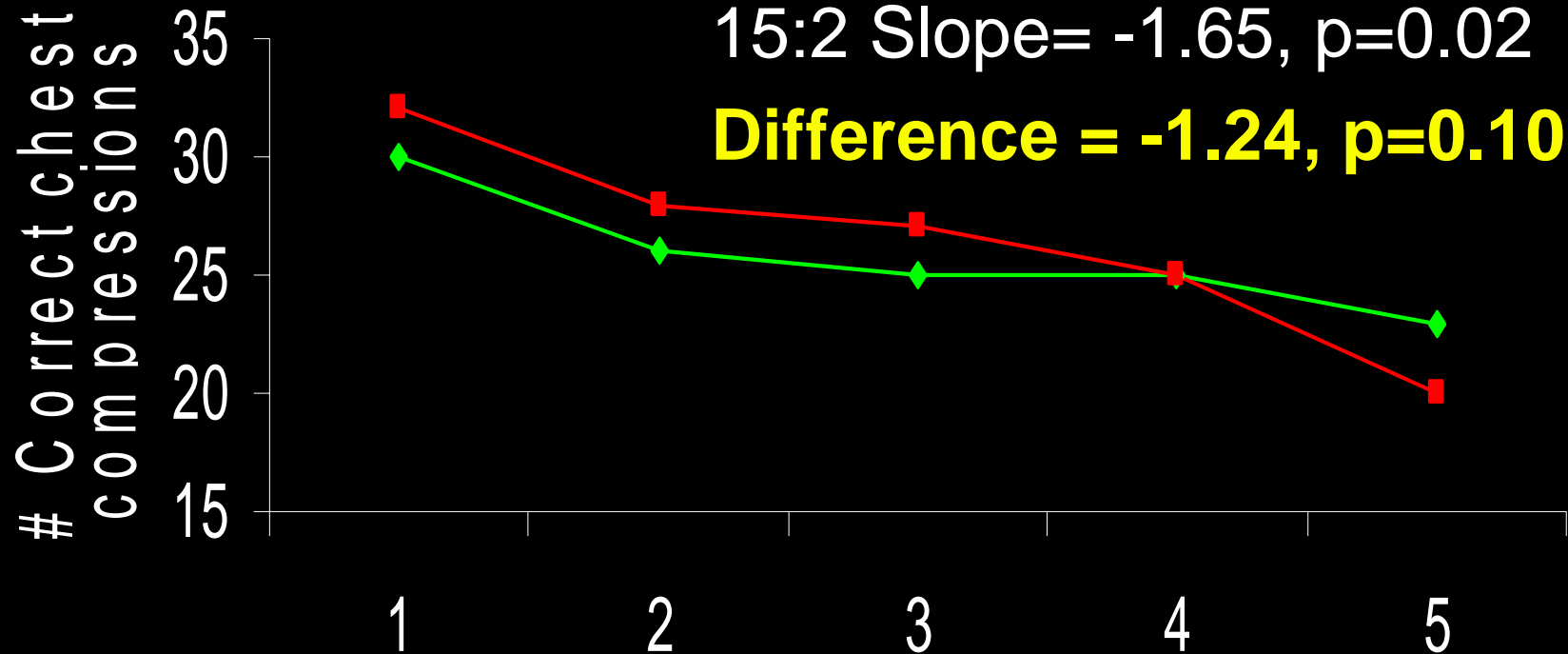
***p=<.0001

Number of Correct Chest Compressions/Minute of CPR N=38

30:2 Slope= -2.89, $p < 0.0001$

15:2 Slope= -1.65, $p = 0.02$

Difference = -1.24, $p = 0.10$

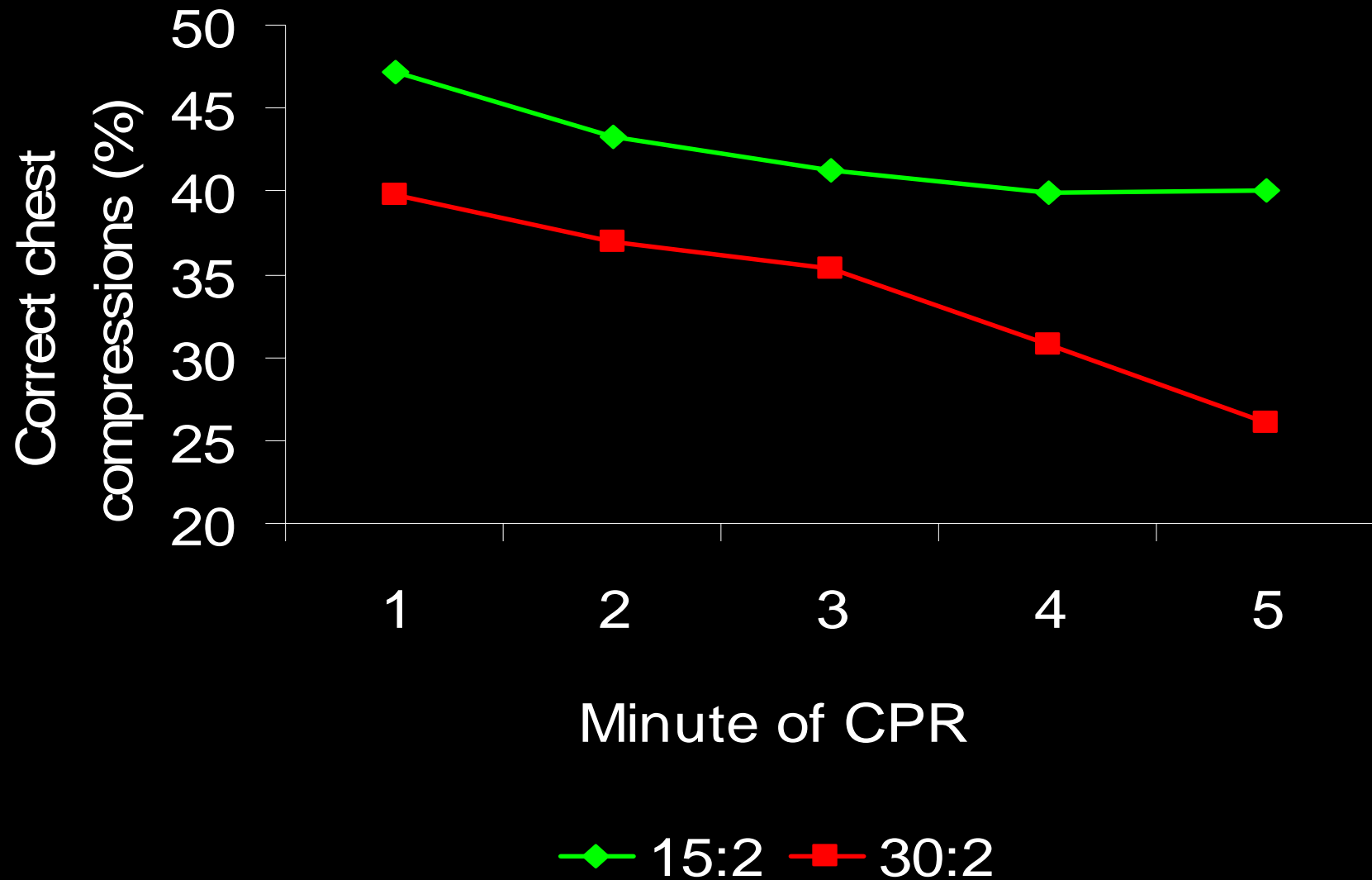


Adjustment for gender, training, and experience made no difference

Minute of CPR

◆ 15:2 ■ 30:2

Percentage of Correct Chest Compressions/Minute of CPR N=38



Survey Results N=42

1. Could you have continued CPR?

	15:2	30:2
No longer	0%	9.5%
1 min	0%	7.1%
2 or more min	100%	83.3%

2. Which method did you prefer?

	15:2	30:2
	61.9%	38.1%

Two Recent Studies

Yannopoulos, Crit Care Med, 2006

- 10 paramedics and 10 laymen
- 5 min of CPR using 15:2 or 30:2 (Cross Over)
 - No difference in fatigue
 - No difference in CPR quality

Heidenreich, Acad Emerg Med, 2006

- 53 medical students
- 9 min of continuous CPR vs 15:2 (Cross Over)
 - Increased fatigue with continuous CPR
 - More compressions delivered with continuous

Discussion

- Was the resting time sufficient for the participants to return to their baseline level?

70% said they were back to baseline

- While physiologic measures of fatigue did not significantly change between groups, participants expressed increased fatigue with the 30:2 ratio in the brief survey
- Participants reached a similar level of exertion using both techniques, at the cost of CPR quality in the 30:2 group

Conclusions

- Despite an large number of chest compressions attempted in the 30:2 group, there were no differences in the number of adequately performed compressions between the 15:2 and the 30:2 groups
- The potential advantage of the 30:2 ratio over the 15:2 ratio appears to be lost as a result of bystander fatigue in a population most susceptible to perform CPR

