SUPRAMAXIMAL ECCENTRICS VERSUS TRADITIONAL TRAINING IN THE BENCH PRESS: A PILOT STUDY WITH **AN AUTOMATED TRAINING DEVICE**

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INTRODUCTION

The effectiveness of eccentric training in improving maximal strength has been known for some time (1). Many athletes employ supramaximal eccentric training (SME) to improve maximal strength, which may improve performance. Investigations into the effects of SME on upper body strength have studied the bench press exercise, with equivocal findings (2, 3, 4). SME training is potentially dangerous and requires multiple spotters. The Intelligent Motion Lifter (IML) is a safe automated mechatronic SME device, which requires one operator and no external load adjustments during training. A prototype of this training device was introduced at the ICST 2010 (5). The purpose of this study was to compare the effects of SME combined with isotonic training and traditional isotonic training on one repetition maximum (IRM) bench press.

 $140.0 \pm 17.5 \text{ kg}$ (p = 0.002) and COMBG IRM: $131.9 \pm 26.2 \text{ to } 140.8 \pm 23.7 \text{ kg}$ (p < 0.001). Total volume was significantly lower in COMBG (12419.6 \pm 2933.4 kg) than in TRADG (17328.7 \pm 2933.4 kg) (p = 0.003). Training method did not significantly affect IRMkg (F(1,14) = 0.057, p = 0.815) or %1RM (F(1,14) = 0.299, p = 0.594). The covariate total volume was not significantly related to IRMkg (F(1,14) = 4.673, p = 0.050), but was significantly related to %IRM (F(1,14)) = 6.729, p = 0.022).



METHODS

Sixteen American football players with 5.2 ± 1.9 (mean \pm SD) years of strength training experience volunteered for the study. Age, height and weight were 21.7 \pm 2.9 years, 184.4 \pm 6.8 cm and 101.6 ± 17.6 kg respectively. The study was part of the normal preseason maximal strength training phase for the players. All players were tested for IRM bench press. The players who volunteered for the study were split into two groups. Strength training for both groups (total 4 per week) was the same except for maximal bench press training, which occurred once per week for six weeks. The traditional group (TRADG) performed traditional isotonic bench press, and the combined group (COMBG) combined SME (eccentric only sets (ECC)) and isotonic training.TRADG warmed up with 6 - 7 sets of progressive loading and trained with 3 - 4 heavy sets (85% or higher) with low repetitions for maximal strength and finished each session with one all-out hypertrophy set (80% IRM). COMBG had the same warm up then ECC 3 x 95%, $I \propto 90\%$, ECC 3 $\times 100\%$, $I \propto 94\%$ and no hypertrophy set. Intensity on the heavy sets increased each week for both groups. See Table 1.

T-tests were used to check for differences between groups in IRM bench before and after the training phase and total volume. An ANCOVA was conducted to determine a statistically significant difference between training groups on change in IRM in kg (IRMkg) and percent change in bench press post training (IRM%) controlling for total volume.

Both training methods increased bench press IRM but the combined group needed less work (indicated by training volume) to elicit an improvement. The IML enabled SME training without spotters or safety concerns, which was as effective as traditional isotonic training with less work. The hypertrophy set for TRADG also may confound the results. Further investigations will examine the use of SME and / or accentuated eccentric loading to increase maximal strength.

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There was no significant difference in IRM between groups before training (p = 0.879). IRM after six weeks of training improved significantly for both groups: TRADG IRM: 133.8 \pm 18.5 to



Figure 2. SME bench press with 211 kg.

Figure 1. The Intelligent Motion Lifter (by intelligent motion gmbh, wartberg/krems, Austria)

COMBINED TRAINING

Max: 100 Tempo: 201 Rest: to set 7 2-3min from set 8 at least 4min

Week I Goal (kg) Week 2 Goal (kg) | Week 3 Goal (kg) | Week 4 Goal (kg) | Week 5 Goal (kg) | Week 6 Goal (kg)

TRADITIONAL TRAINING

Max: 100)O T	empo: 2	201	Rest: to set 7 2-3min from set 8 at least 4min												
	Week I	Goal (kg)	Week 2	Goal (kg)	Week 3	Goal (kg)	Week 4	Goal (kg)	Week 5	Goal (kg)	Week 6	Goal (kg)					

I	5 x	44	5 x	44	5 ×	44	5 x	44	5 x	44	5 x	44	1	5 x	44	5 x	44	5 ×	44	5 x	44	5 x	44	5 x	44
2	3 x	52	3 x	57	3 x	57	2	3 x	52	3 x	52	3 x	52	3 x	52	3 x	57	3 x	57						
3	lх	60	lх	60	l x	60	lх	64	lх	70	lх	70	3	Ιx	60	lх	60	lх	60	lх	64	lх	70	lх	70
4	lх	65	lх	65	lх	67	lх	72	lх	77	lх	77	4	Ιx	65	lх	65	lх	67	lх	72	lх	77	lх	77
5	lх	70	lх	70	l x	74	lх	80	lх	84	lх	84	5	Ι×	70	lх	70	l x	74	lх	80	lх	84	l x	84
6	Ιx	75	lх	77	lх	82	lх	86	lх	89	lх	90	6	Ιx	75	lх	77	lх	82	lх	86	lх	89	l x	90
7	lх	80	lх	84	lх	90	lх	94	lх	94	lх	96	7	Ιx	80	l x	84	l x	90	lх	94	lх	94	l x	96
8	ECC 3x	95	ECC 3x	100	ECC 3x	105	ECC 3x	105	ECC 2x	106	ECC 2x	107	8	Ιx	85	lх	89	lх	94	lх	97	lх	99	lх	101
9	lх	90	lх	94	lх	97	lх	101	lх	104	lх	107	9	Ιx	90	lх	94	l x	97	lх	101	lх	104	lх	107
10	ECC 3x	100	ECC 3x	105	ECC 3x	108	ECC 3x	110	ECC Ix		ECC Ix	112	10	3 x	82	3 x	86	3 x	90	3 ×	93	3 x	96	3 ×	99
	lх	94	lх	96	lх	98	lх	102	lх	104	lх	108	11	10-12 ×	80	10-12x	80	10-12 x	80	10-12 ×	80	10-12 x	80	10-12 x	80

Table 1. The six-week training program for the combined training and traditional training groups.

