Effects of Magnesium Supplementation on Muscle Soreness and Performance

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Thesis

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Introduction

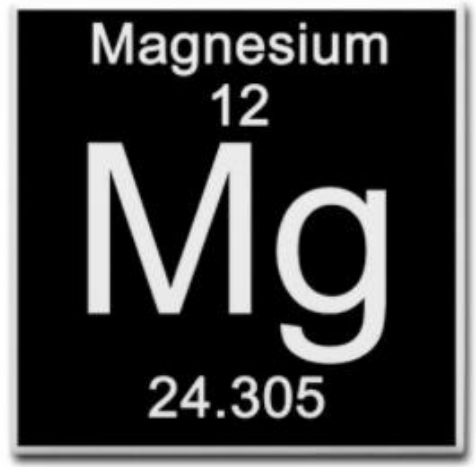
- Magnesium (Mg) as an ergogenic aid
  - Specific catalyst for more than 300 enzymatic reactions
- Common mineral deficiency
- Recommended Dietary Allowance (RDA)
  - Men 19-30 years: 400mg/day
  - Women 19-30 years: 310mg/day
- Athletes tend to be more deficient due to excess sweat losses
- How is Mg assessed?

Table 1: Recommended Dietary Allowances (RDAs) for Magnesium [1]

Age	Male	Female	Pregnancy	Lactation
Birth to 6 months	30 mg*	30 mg*		
7–12 months	75 mg*	75 mg*		
1–3 years	80 mg	80 mg		
4–8 years	130 mg	130 mg		
9–13 years	240 mg	240 mg		
14–18 years	410 mg	360 mg	400 mg	360 mg
19–30 years	400 mg	310 mg	350 mg	310 mg
31–50 years	420 mg	320 mg	360 mg	320 mg
51+ years	420 mg	320 mg		

*Adequate Intake (AI)

- Equivocal results for magnesium supplementation and performance
  - Kass et al, 2015, Brilla et al, 2014, Setaro et al, 2014, found Mg improved strength performance in non-deficient individuals
  - Terblanche at al, 1992, determined Mg does not improve performance for marathon runners
  - Moshli et al, 2012, concluded Mg supplementation had no impact on hand grip and knee strength for *inactive* older females
- Research is lacking on the effects of Mg supplementation on performance in a deficient population



Methods

- 24 recreationally active college-aged students recruited
  - *n = 22*
- **Inclusion criteria:**
  - Recreationally active
  - Bench press at least 1 x week for the past 6 months
- **Exclusion criteria:**
  - All other supplement or medication use
- **Recruitment:** North Alabama- campus and CrossFit
  - IRB- approved
  - Written, informed consent obtained
  - Research grant approved
- 7-day food and training diary baseline measurements
- Anthropometric measurements

Methods Cont.

Exercise Protocol

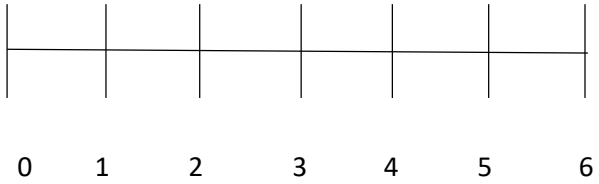
Soreness-

- Estimate 1 RM using CSCS 4th Edition
  - 1 warm -10 reps
  - Choose a weight they can lift between 6-8 times
- Eccentric bench press soreness protocol (85% of their 1RM)
  - Hollander et al, 2003, 4 x 12 reps @ 80 1-RM
  - Howatson et al, 2007 3 x 15 reps @ 100% Eccentric RM- elbow flexors
  - Meneghel et al, 2014, 4x 15 reps @ 1RM
- Pilot work
  - 4 participants- 5 sets of 10 eccentric bench press- SUCCESS

Performance Protocol

- 3 sets to failure at 65%, 75%, 85% of previously determined 1RM

- **Soreness Ratings**
  - Delayed Onset of Muscle Soreness (DOMS)
- Likert scale
- Meneghel et al, 2014



- 0 = no soreness
- 1= dull feeling of soreness
- 2= light, continuous soreness
- 3= more than light soreness
- 4= annoying soreness
- 5= severe soreness
- 6= intolerable soreness

Rate of Perceived Exertion (RPE)

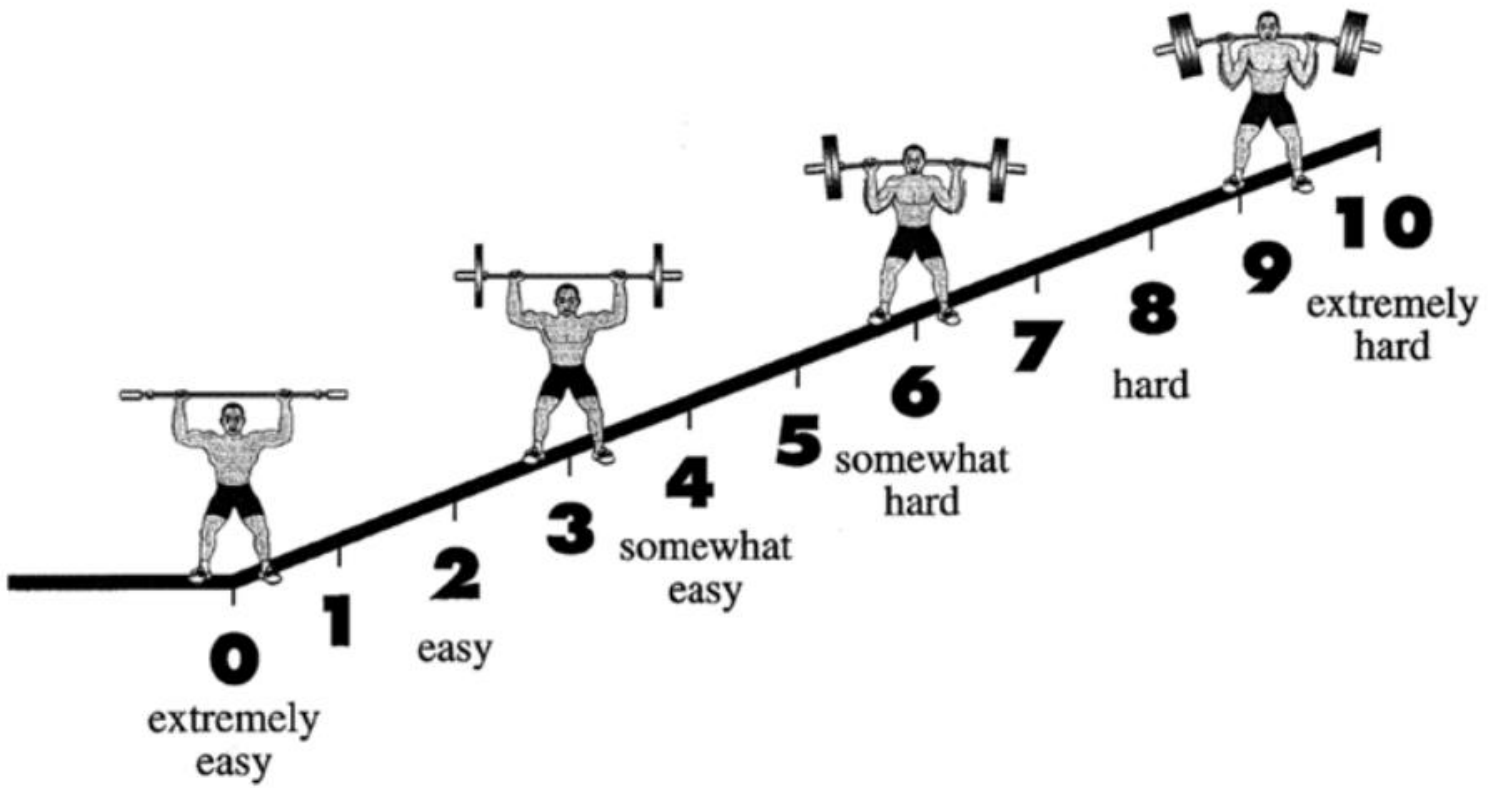


Fig. A.5 Adult OMNI-resistance exercise RPE scale, male (Robertson 2004)

Statistical Analyses

- Paired *t* test pre vs post within Mg and Pla
  - 65%, 75%, and 85% reps to failure
  - Total Volume (TV)
- 2 (group) x 2(time point) ANOVA
- 2 (trial) x 5 (time point) repeated measures ANOVA
- 2 (group) x 3(time point) ANOVA (Delta value)
- Post hoc tests

Table 1 Descriptive characteristics for participants ($n = 22$)

Variable	Mean	SD
Age (years)	21. 5	1.53
Height (cm)	173.6	9.1
Weight (kg)	84.0	22.6
Body Fat (%)	26.2	8.1
Estimated VO_2 max (ml/kg/mm) (Male, Female)	43.1 37.1	5.1 4.2

Values are means and standard deviations

Table 2 7-Day Food and Training Recall Analysis

	Mean	SD
Mg Intake (mg/day)	209.1	114.6
Mg RDA (%)	52.2	28.6

Values are means and standard deviations

Performance Results

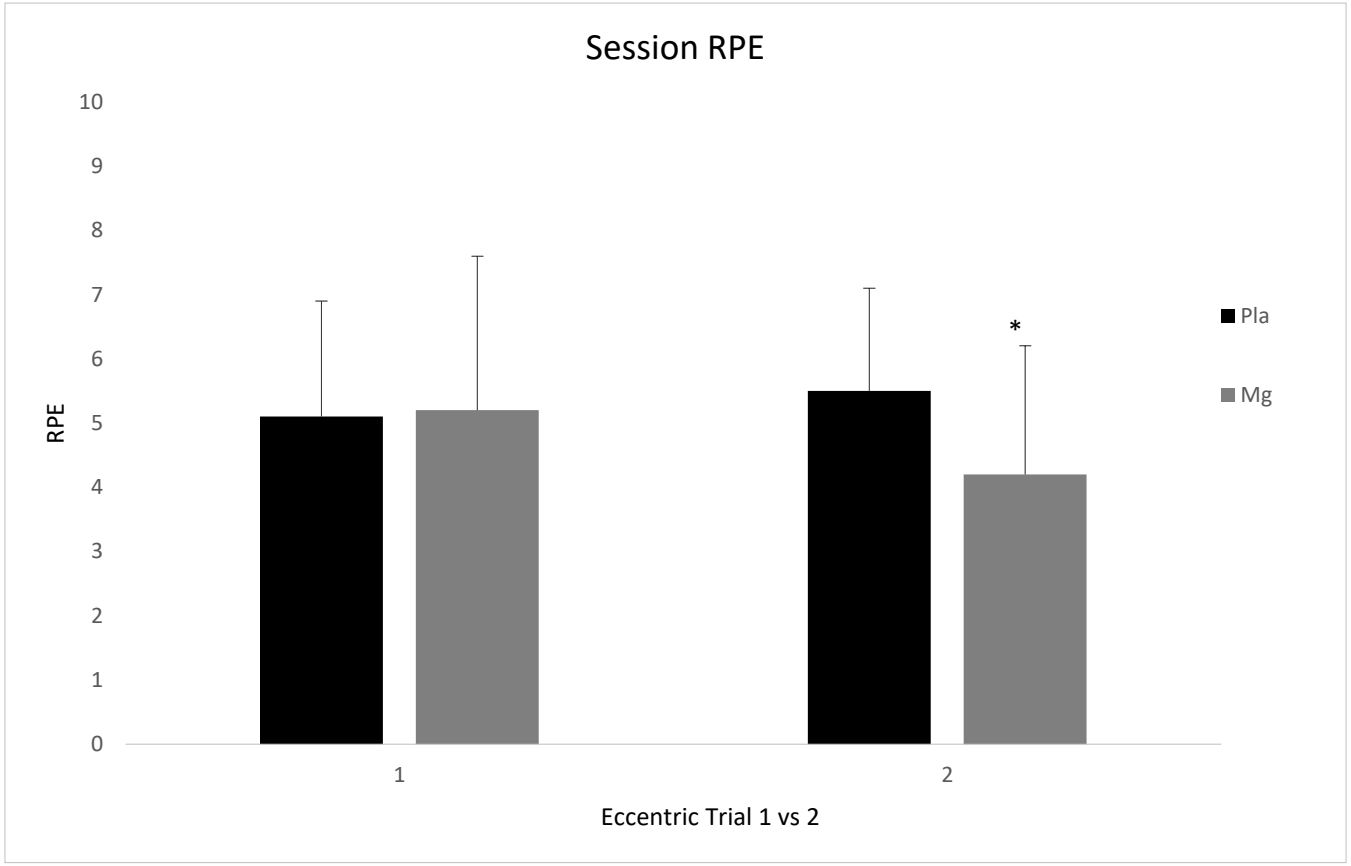
Table 3: Performance measures of Pre vs Post for Magnesium and Placebo

		Pre	Post
65% RTF	Mg	17.3 ± 4.2	18.2 ± 5.0†
	Pla	18.8 ± 4.2	18.8 ± 3.1
75% RTF	Mg	7.1 ± 2.3	7.6 ± 3.0†
	Pla	8.5 ± 3.4	8.5 ± 3.2
85% RTF	Mg	3.6 ± 1.4	4.0 ± 1.7
	Pla	4.4 ± 3.0	4.6 ± 2.7
TV	Mg	3428.2 ± 1625	3677.7 ± 1657
	Pla	3347.3 ± 1303	3437.3 ± 1309

RTF = Reps to failure
TV= Total Volume
Note: † $p = 0.08$, Pre vs Post Performance Trials

Results- Session RPE Eccentric Trials

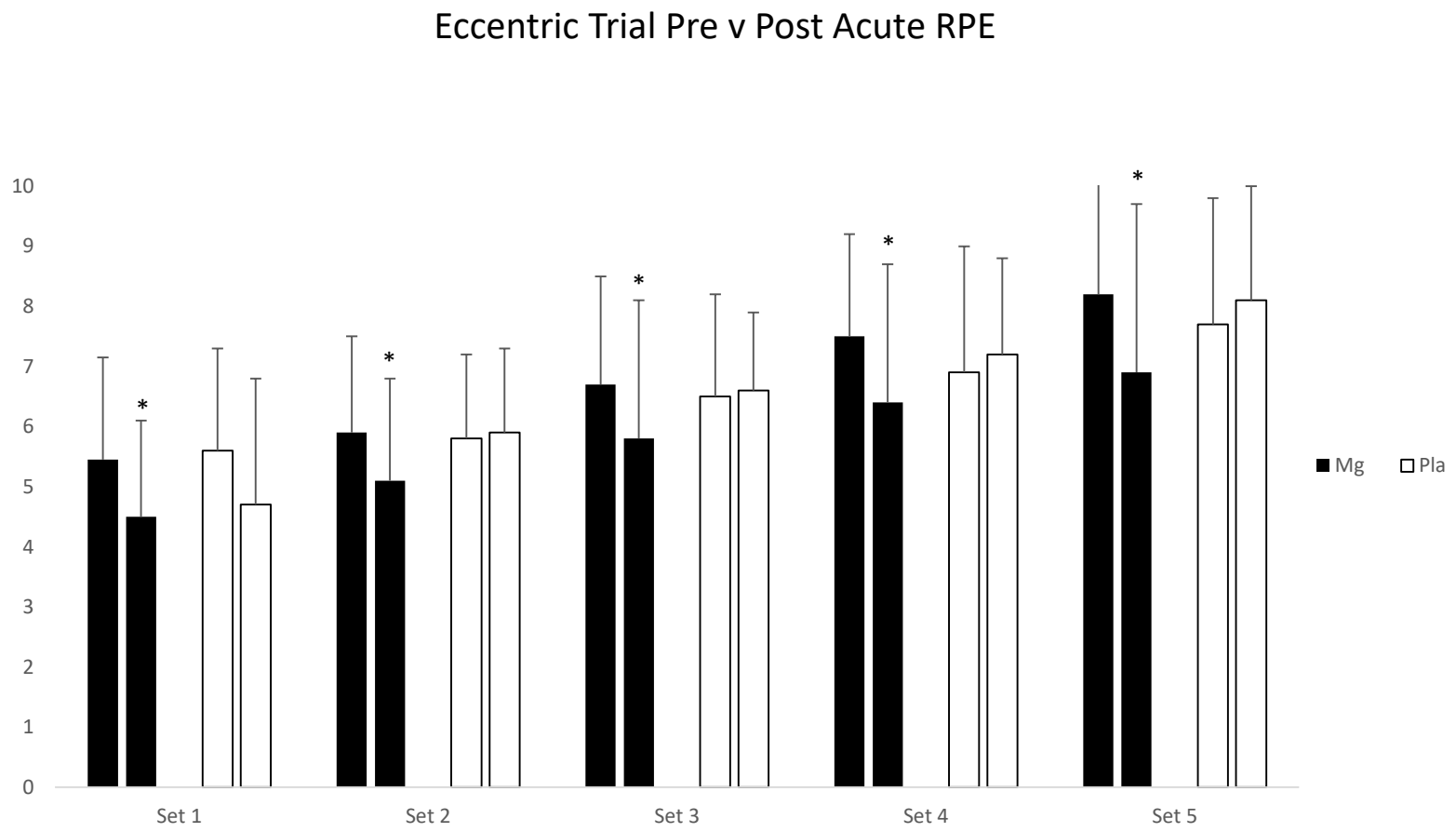
- No sig main effect for trial
- No significant main effect for group
- Significant trial x group interaction (p = 0.008)



*significant at p < 0.05

Eccentric Trial Acute RPE Results

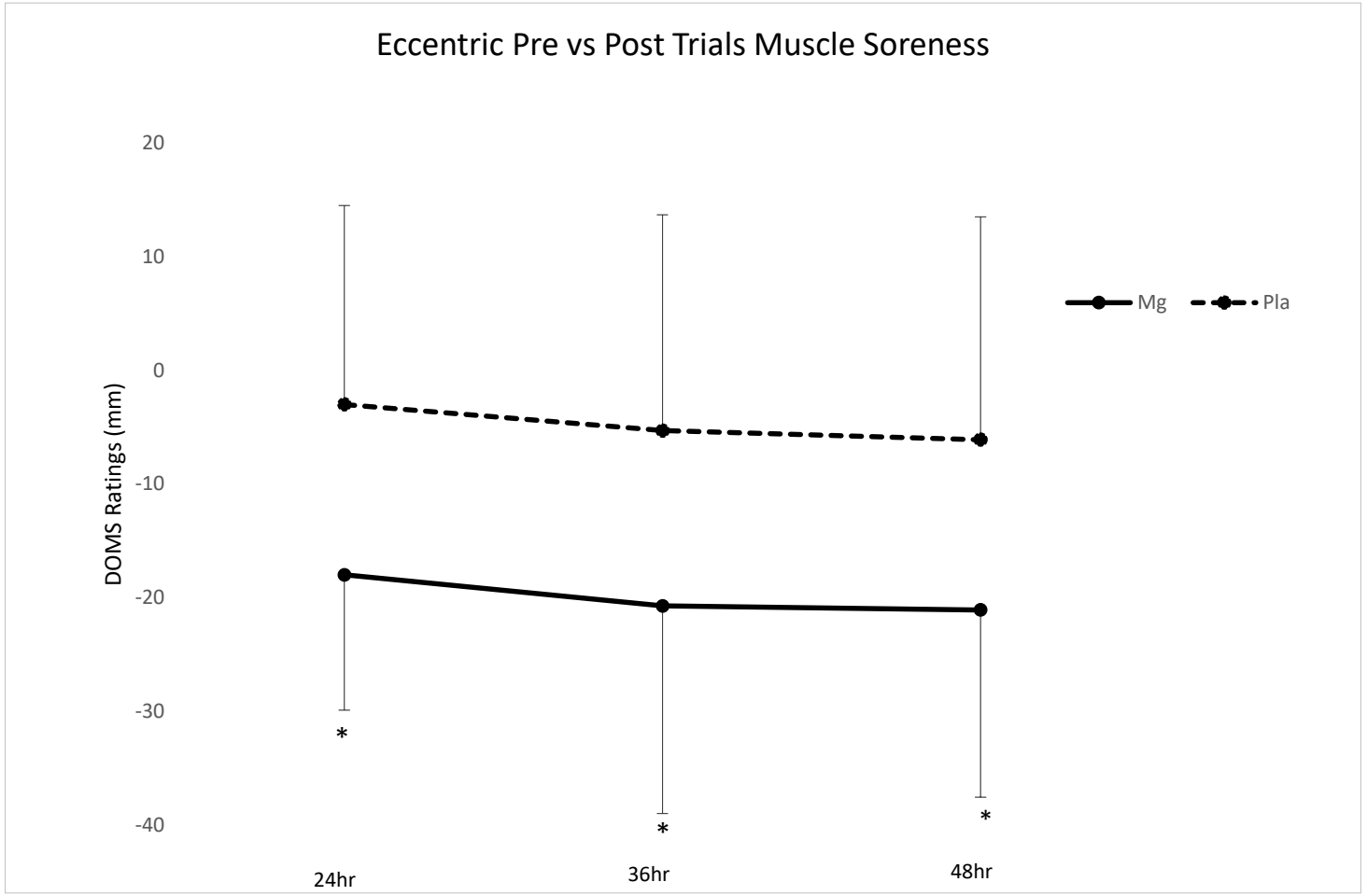
- Significant main effect for trial (p = 0.01) Significant main effect for time point (p = 0.002)
- No significant trial x time point interaction (p = 0.713)



* significance at p < 0.05

Soreness Delta

- No significant main effect for time point (24 vs 36 vs 48) (p = 0.551)
- Significant main effect for group (p = 0.036)
- No significant interaction (p = 0.995)



* significant at p < 0.01

Conclusion

- 350mg/day of Mg supplementation significantly reduces muscle soreness in deficient, recreationally active, individuals
- Mg supplementation approached significance for 65%, and 75% reps to failure in bench press

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