COMPARISON OF THE ACUTE EFFECTS PRODUCED BY SELF-MYOFASCIAL RELEASE, STATIC STRETCHING, AND DYNAMIC STRETCHING ON ISOKINETIC POWER OUTPUTS

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Background Research

- Static Stretching
  - Movement of a limb to end of ROM and held for 15-60 seconds
  - Benefits
    - Increases ROM
    - Prevents injuries
    - Decreases muscle soreness
  - Results suggest SS impairs performance (Behm et al)

Background Research

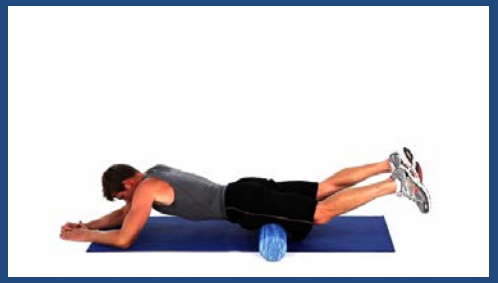
- Dynamic Stretching
  - Controlled movement through AROM
  - Results suggest DS (Behm et al.)
    - Increases performance
    - Neutral Effects

Background Research

- Self-Myofascial Release, “foam rolling”
  - Back and forth movements over a dense foam roller, starting at proximal portion of muscle, working to distal portion of the muscle
  - Benefits
    - Facilitate soft tissue extensibility
    - Increase ROM
    - Potentially promoting optimal skeletal function
  - Acute effects not extensively studied (Macdonald & Healey)

Purpose

- To compare the acute effects of SMR, SS, and DS on isokinetic power outputs



Hypotheses

1. SMR will have no acute effects on isokinetic power outputs compared to baseline measurements.
2. Static stretching will decrease the isokinetic power outputs when compared to baseline measurements.

Hypotheses (cont.)

3. Dynamic stretching will increase the isokinetic power outputs when compared to baseline measurements.

Hypotheses (cont.)

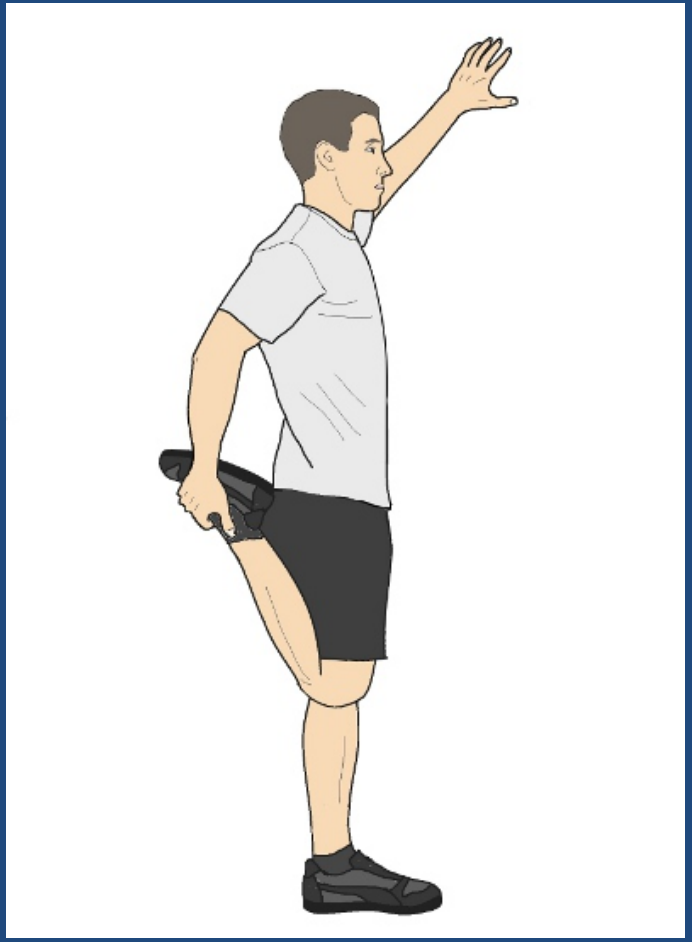
4. Dynamic stretching will be more effective in increasing isokinetic power outputs as compared to self-myofascial release and static stretching.

Participants

- N = 18
  - Recreationally active college-aged males
  - Volunteer students from Manchester University

Instrumentation

- Static Stretching Protocol (Manoel et al.)
  - Dominant leg
  - 1 quadriceps stretch
  - 3 sets x 30 seconds
  - 20 sec rest between sets



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Instrumentation

- Dynamic Stretching Protocol (Manoel et al.)
  - 1 quadriceps stretch (butt-kicks)
  - 3 sets x 30 seconds
  - 20 sec rest between sets

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Instrumentation

- SMR Protocol (MacDonald et al.)
  - Dominant leg
  - Roll over quad for 1 min
  - Rest 30 seconds
  - Roll over quad for another minute
  - Total of 3-4 x per minute

1

2

Instrumentation

- Isokinetic Power Outputs
  - Cybex 340 isokinetic dynamometer
  - HUMAC 2009 Software
  - Measure peak torque and mean power for extension of dominant leg
  - Velocities
    - $60 \cdot s^{-1}$
    - $240 \cdot s^{-1}$

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Procedures

- IRB Approval
- Informed Consent
- 3 days of testing
- Separated by 48 hours
- Day 1
  - Familiarization
- Day 1-3
  - 5-min warm-up at 50W on cycle ergometer
  - Pre-stretching IK test
  - Stretching Protocol (SS, DS, or SMR)*
  - Post-stretching IK test

*SS,DS,SMR; SS,SMR,DS; DS,SS,SMR; DS,SMR,SS; SMR,SS,DS; SMR,DS,SS

Data Analysis

- Password protected computer
- PASW software
- Repeated measures ANOVA
  - Difference in means
  - Percent change = (pre-post/pre)*100
- Paired Sample T-tests
- Significance level at <0.05

Results

1. Self-myofascial release demonstrated no significant acute effects on mean power and peak torque at both
   - $60°s^{-1}$ (p=0.296, 0.817)
   - $240°s^{-1}$ (p=0.288, 0.538)

Results (cont.)

2. Static stretching demonstrated no significant acute effects in isokinetic power outputs (MP, PT) at both
   - $60°s^{-1}$ (p=0.099, 0.085)
   - $240°s^{-1}$ (p=0.524, 0.593)

Results (cont.)

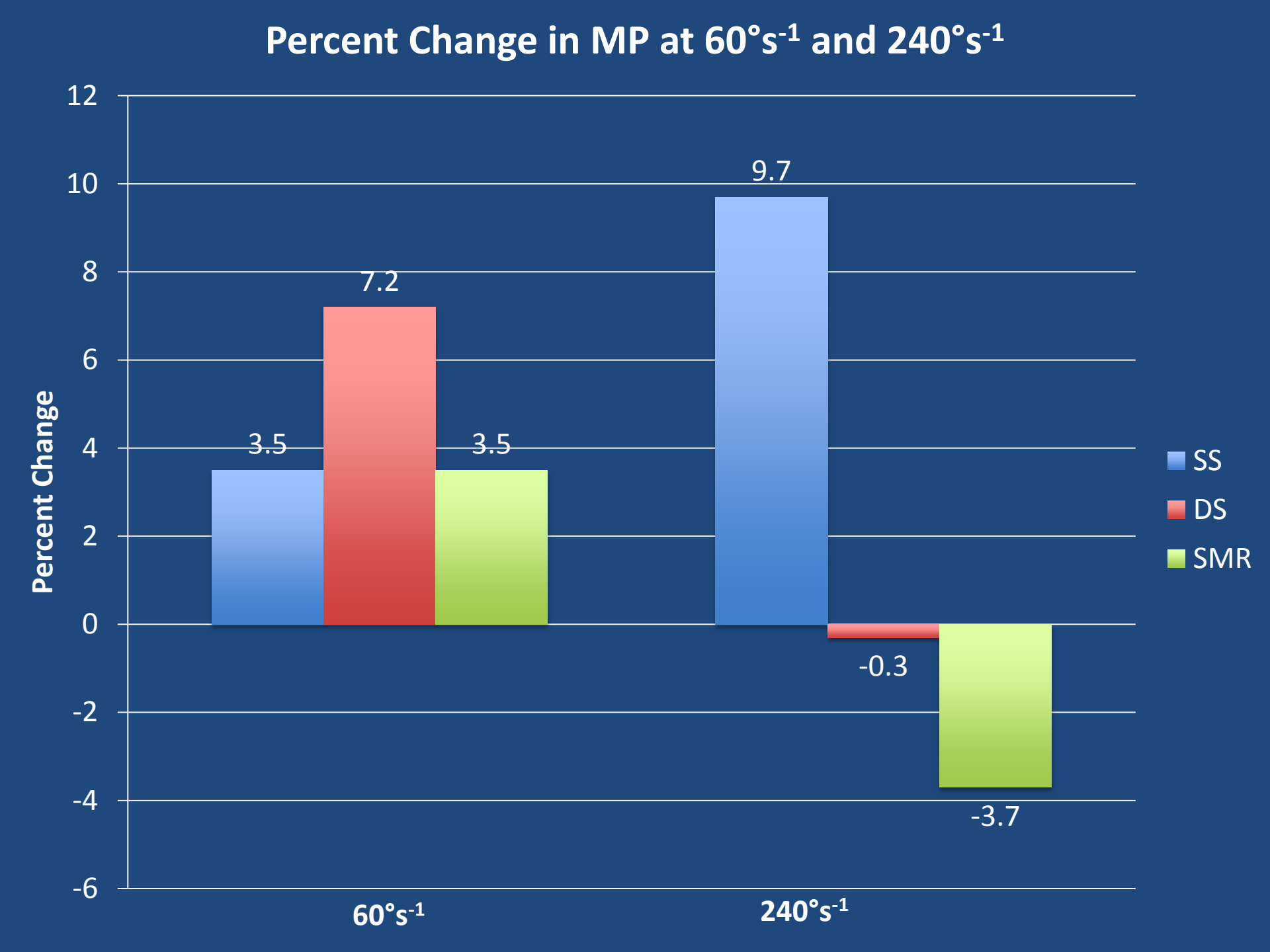
3. Dynamic Stretching demonstrated no significant acute effects on the isokinetic power outputs (MP, PT) produced at both
   - $60°s^{-1}$ (p=0.121, 0,244)
   - $240°s^{-1}$ (p=0.819, 0.949)

Results (cont.)

4. The findings of the present study demonstrated that isokinetic power outputs, mean power and peak torque (MP, PT), were not significantly different at the $p<0.05$ level when comparing the individual stretching protocols at both
   - $60°s^{-1}$ ($p=0.633$, 0.454)
   - $240°s^{-1}$ ($p=0.946$, 0.676).

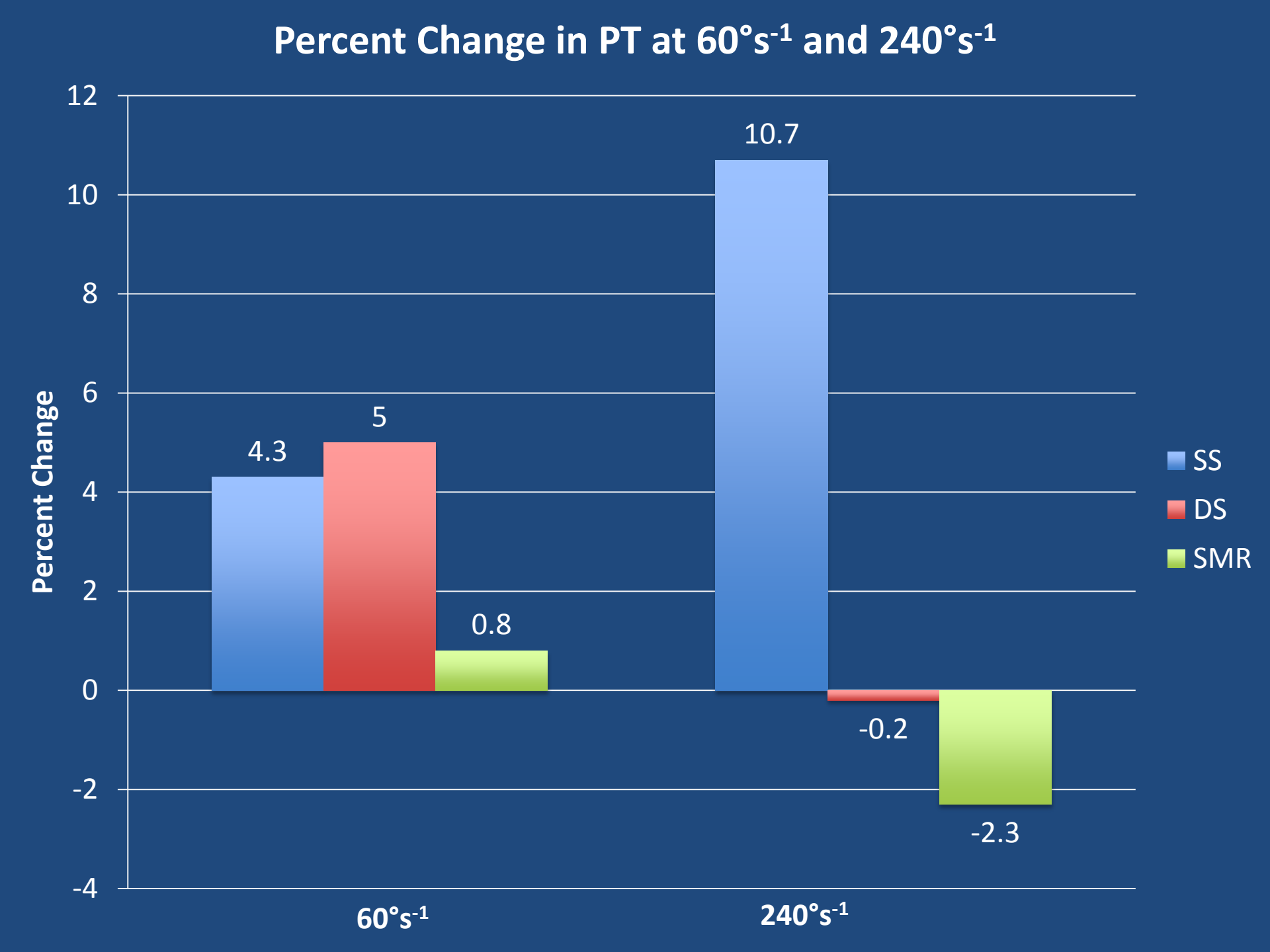
Mean power values (W) ± SEM for 60° s^{-1}			
Protocol	*Before*	*After*	*% Change*
Static Stretching	120.9 ± 32.3	124.9 ± 34.7	3.5%
Dynamic Stretching	118.8 ± 35.1	125.7 ± 36.7	7.2%
Self-Myofascial Release	121.8 ± 35.4	125.2 ± 38.9	3.5%

Mean power values (W) ± SEM for 240°s^{-1}			
Protocol	*Before*	*After*	*% Change*
Static Stretching	193.4 ± 75.7	188.1 ± 72.3	9.7%
Dynamic Stretching	191.3 ± 79.4	188.5 ± 81.7	-0.3%
Self-Myofascial Release	192.5 ± 69.1	186.6 ± 73.1	-3.7%


Percent Change in MP at 60°s-1 and 240°s-1
12
10
8
6
4
2
0
-2
-4
-6
Percent Change
3.5
7.2
3.5
9.7
-0.3
-3.7
60°s-1
240°s-1
SS
DS
SMR

Peak Torque values (W) ± SEM for 60° s^{-1}			
Protocol	*Before*	*After*	*% Change*
Static Stretching	139.8 ± 37.7	145.8 ± 42.1	4.3%
Dynamic Stretching	136.9 ± 40.5	142.6 ± 44.0	5.0%
Self-Myofascial Release	145.4 ± 44.7	146.3 ± 46.7	0.8%

Peak Torque values (W) ± SEM for 240°s^{-1}			
Protocol	*Before*	*After*	*% Change*
Static Stretching	70.6 ± 27.4	71.8 ± 27.0	10.7%
Dynamic Stretching	72.8 ± 27.1	73.0 ± 29.8	-0.2%
Self-Myofascial Release	73.8 ± 24.8	72.5 ± 26.9	-2.3%


Percent Change in PT at 60°s-1 and 240°s-1
12
10
8
6
4
2
0
-2
-4
Percent Change
4.3
5
0.8
10.7
-0.2
-2.3
60°s-1
240°s-1
SS
DS
SMR

Conclusion

- No individual stretch is more advantageous to perform prior to subsequent performance.

Discussion

- Lack of increase in muscle temperature
- Difference in length of protocol
- Unaccounted for factors
  - Nutrition
  - Activity level outside of study

Future Research

- Combination of stretching techniques
- Duration, intensity, recovery
- Age of subjects
- Different measure of power

Questions?

References

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12. MacDonald GZ, Penney MDH, Mullaley ME, et al. An acute bout of self-myofascial release increases range of motion without a subsequent decrease in muscle activation or force. *Journal of Strength and Conditioning Research*. 2013;27(3):812-821.

13. Healey K, Dorfman L, Riebe D, Blanpied P, Hatfield D. The effects of foam rolling on myofascial release and performance. *Journal of Strength and Conditioning Research*. 2011;25:S30A,S31.