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Conflict of Interest Statement

I have no actual or potential conflict of interest in relation to this presentation.

From the Lab to Your Weight Room- 2019 Edition

3 Posters from NSCA National

- Chris Bailey
- Tim Suchomel
- Bryan Mann

SPRINT AND CHANGE OF DIRECTION ADAPTATIONS FOLLOWING 10 WEEKS OF TRAINING WITH WEIGHTLIFTING CATCHING OR PULLING DERIVATIVES: PRELIMINARY FINDINGS

Timothy J. Suchomel, Shana M. McKeever, and Paul Comfort

Introduction

- Weightlifting (WL) pulling derivatives that exclude the catch phase may provide a comparable (1, 2) or superior (4, 6-8) training stimulus compared to WL catching derivatives
  - Peak force, velocity, power, rate of force development, impulse, and work

- Although several cross-sectional studies exist, limited research has compared the effects of longitudinal training with either WL catching or pulling derivatives
  - One study completed: Comfort et al., 2018 ahead of print

Comfort et al., 2018 ahead of print

- 8 weeks of training performed in-season (2 days per week)
  - 4 weeks of 3x5
  - 4 weeks of 3x3

- Two groups: Catch and Pull
  - Performed either the Power Clean (PC) or Clean Pull (CP) on Day 1
  - Performed either the Mid-thigh Power Clean or Mid-thigh Pull on Day 2
  - All lifts performed at same relative loads (e.g. PC and CP both at 80% 1RM PC)

- Both groups improved; however, there were no statistical or practically meaningful differences between groups
  - IMTP Force at 100ms, 200ms, 250ms, or Relative peak force
  - CMJ Height, RSImod, Time to takeoff, or Relative peak power

Introduction

- WL pulling derivatives may provide a greater force and velocity training stimulus based on how they are loaded (Suchomel et al., 2017)
  - Use of loads in excess of 1RM catching derivative (Force overload)
  - Use of more ballistic exercises and lighter loads (Velocity overload)

- WL pulling derivatives may benefit explosive strength characteristics and transfer to speed-based athletic movements such as sprinting and change of direction tasks

Purposes and Hypotheses

- P1: Examine and compare the 30-m sprint and 505 change of direction adaptations that result from training with WL catching or pulling derivatives.

- P2: Examine the training effects of using a force- and velocity-specific overload stimulus with WL pulling derivatives compared to the traditional loading of WL catching and pulling derivatives

- H1: It was hypothesized that all groups would improve their performance, while no differences would exist between the CATCH and PULL groups

- H2: However, it was also hypothesized that the OVERLOAD group would produce greater adaptations compared to both the CATCH and PULL groups

Methods – Subjects

- 14 resistance-trained men randomly assigned to 1 of 3 training groups:
  - Catch Group (CATCH): n = 4, age = 24.3 ± 3.3 years, height = 181.2 ± 2.5 cm, body mass = 88.3 ± 11.8 kg, estimated relative 1RM back squat = 2.0 ± 0.5 kg / kg)
  - Pull Group (PULL): n = 5, age = 22.4 ± 2.6 years, height = 179.5 ± 2.6 cm, body mass = 95.1 ± 14.1 kg, estimated relative 1RM back squat = 1.6 ± 0.2 kg / kg)
  - Overload Group (OL): n = 5, age = 21.6 ± 0.5 years, height = 175.8 ± 4.6 cm, body mass = 81.2 ± 11.1 kg, estimated relative 1RM back squat = 1.9 ± 0.2 kg / kg)
- Completed 10 weeks of training (3 times per week)
  - 3 weeks of 3 x 10
  - 4 weeks of 3 x 5
  - 1 week of 5 x 5 (Overreach)
  - 2 weeks of Taper: 3 x 3 and 3 x 2

Methods – 10 week Training Programs

- CATCH Group

Training Block	Day 1	Day 2	Day 3
Strength-Endurance	Back Squat Military Press Split Squat Bench Press	**Power Clean from Floor** Stiff-legged Deadlift Bent-over Row Pull-up	**Power Clean from Floor** Back Squat Incline Bench Press Bent-over Row
Max-Strength + Overreach	Push Press Back Squat Bench Press Lunge	**Mid-thigh Power Clean** **Power Clean from Floor** Stiff-legged Deadlift Pull-up	**Mid-thigh Power Clean** Back Squat Incline Bench Press Dumbbell Row
Speed-Strength	Jerk ¼ Squat + Squat Jump Bench Press	**CM Power Clean** **Hang Power Clean**	Jerk **Hang Power Clean**

- PULL and OVERLOAD Groups

Training Block	Day 1	Day 2	Day 3
Strength-Endurance	Back Squat Military Press Split Squat Bench Press	**Clean Pull from Floor** Stiff-legged Deadlift Bent-over Row Pull-up	**Clean Pull from Floor** Back Squat Incline Bench Press Bent-over Row
Max-Strength + Overreach	Push Press Back Squat Bench Press Lunge	**Mid-thigh Pull** **Clean Pull from Floor** Stiff-legged Deadlift Pull-up	**Mid-thigh Pull** Back Squat Incline Bench Press Dumbbell Row
Speed-Strength	Jerk ¼ Squat + Squat Jump Bench Press	**CM Shrug** **Hang High Pull**	Jerk **Jump Shrug**

Methods – Testing

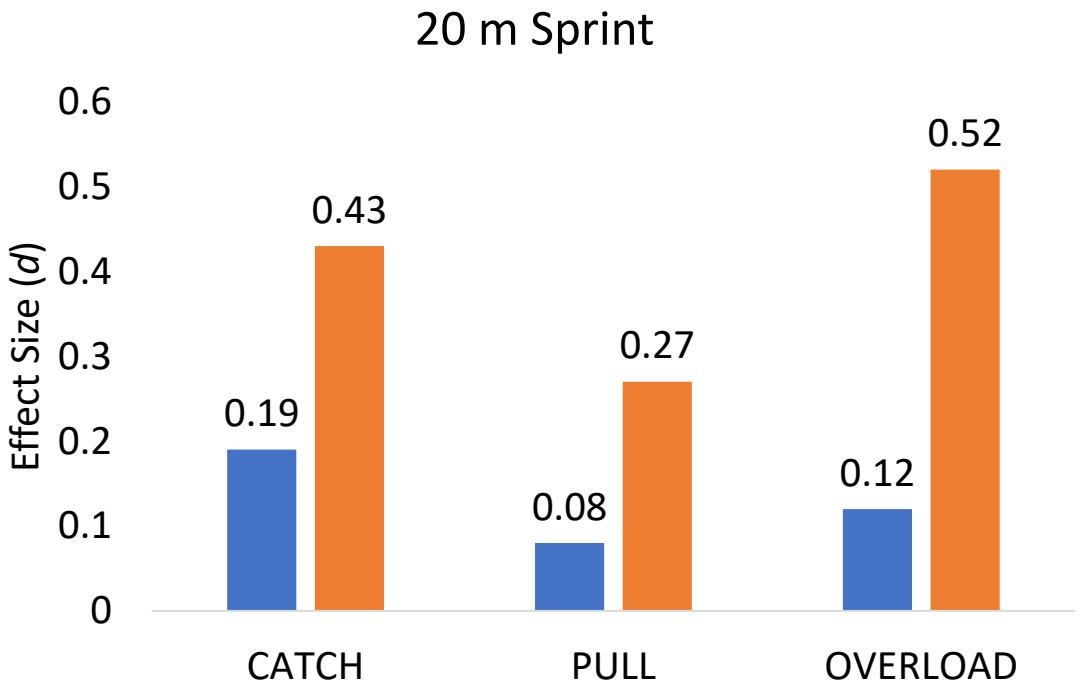
- 30 m sprints and the 505 change of direction test were performed during pre- (PRE), mid- (MID), and post-intervention (POST) sessions
  - MID occurred after 3 x 10 and 3 x 5 training blocks
  - POST occurred within one week of final training session

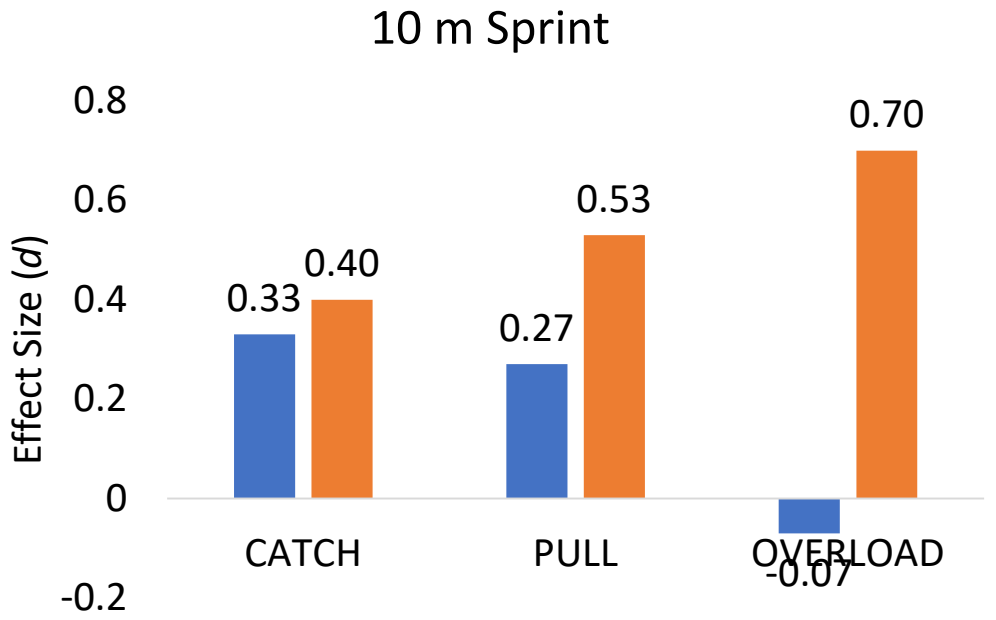
- 10-, 20-, and 30 m sprint and 505 change of direction times were compared from PRE-MID and PRE-POST within each group

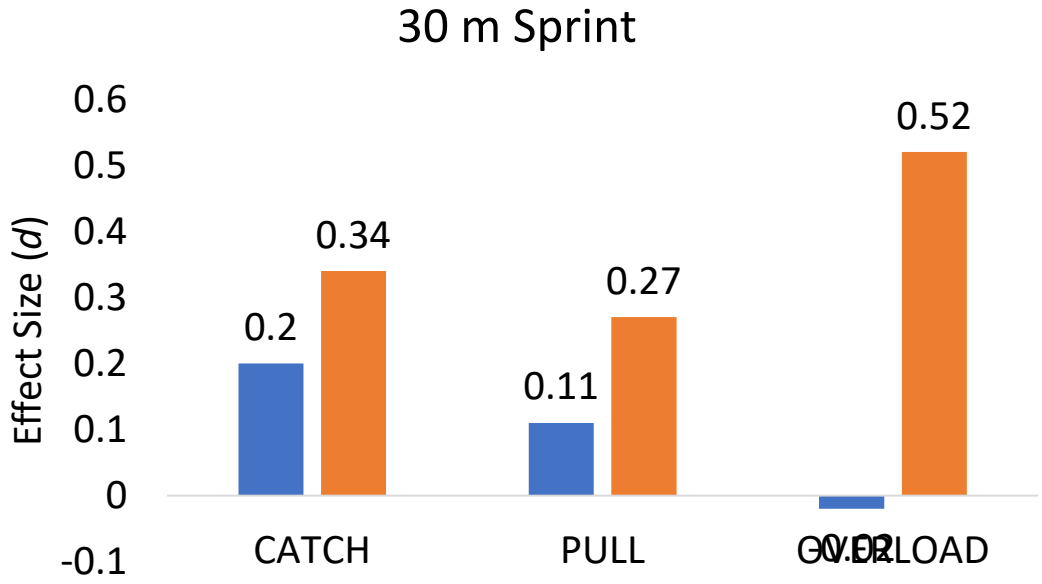
- Cohen's *d* used to determine practical significance (Rhea, 2004)
  - Highly trained (training for at least 5 years)
  - Trivial (< 0.25)
  - Small (0.25-0.49)
  - Moderate (0.50-1.0)
  - Large (> 1.0)

Sprint Results

- PRE-MID
- PRE-POST

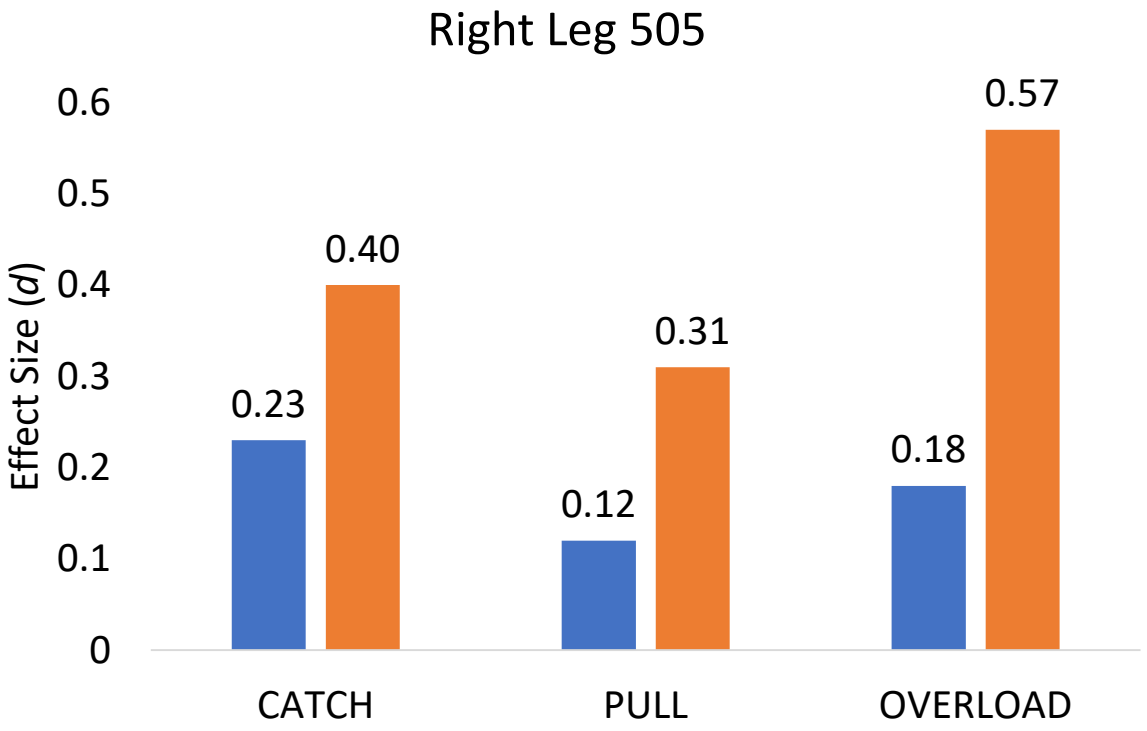


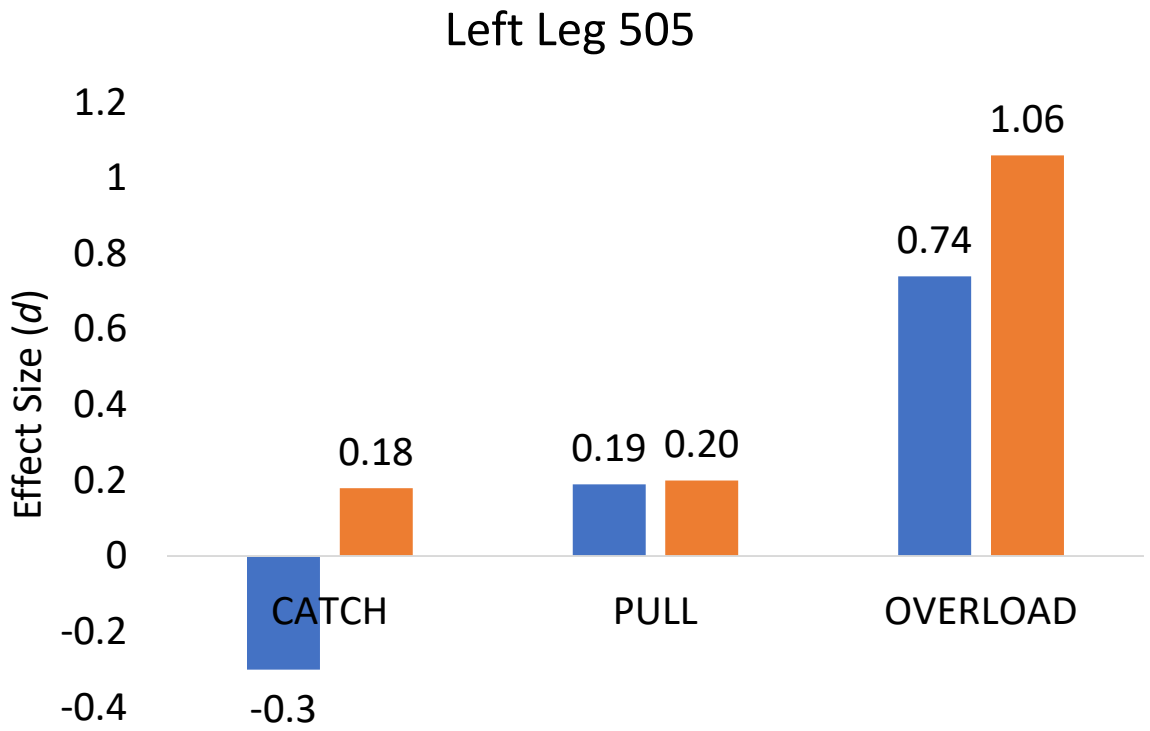




505 COD Results

- PRE-MID
- PRE-POST





Conclusions and Practical Applications

- The CATCH, PULL, and OVERLOAD groups all improved their 10, 20, and 30 m sprint and 505 times
  - There was no meaningful differences between CATCH and PULL groups
  - The OVERLOAD group produced the greatest sprint and change of direction adaptations

- Training with weightlifting movements, with or without the catch phase, can improve both sprint and change of direction times
  - When loaded similarly, WL catching and pulling derivatives may produce similar adaptations
  - Using a force- (loads > 1RM PC) and velocity-specific (ballistic exercises with light loads) overload stimulus may produce greater adaptations

Thank you!

- Shana McKeever
- Paul Comfort

- Bryan Mann
- NSCA

Force production asymmetry is task dependent in collegiate baseball players

C. Bailey, T. McInnis, K. Nilson, J. Batcher and T. North

- Research evaluating strength and force production asymmetry has recently evaluated its impact on training and jumping performance 1-6,11,13. Sato and Heise (2012) showed that weight distribution asymmetry may alter squatting technique and, therefore subsequent training adaptation. Bailey et al. (2013) and Bell et al. (2014) demonstrated that it may be a detriment to jumping performance. Research has also shown that weaker athletes and non-athletes may well be more likely to exhibit force asymmetries2,5. While the ability and the prevalence of measuring asymmetry appears to be increasing, practitioners should exercise caution when making decisions based on single tests.
- It is easy to assume that the magnitude and direction of asymmetries are expressed consistently regardless of task, but there are studies have shown that this may not be the case3,8. Maloney and colleagues showed that asymmetry magnitude may change depending on the type of jump evaluated and Bailey et al.3 demonstrated a lack of association between bilateral isometric and dynamic performance symmetry measures such as the isometric mid-thigh pull and countermovement jumps (CMJ).
- To the current authors knowledge, these are the only two studies to evaluate the relationships of asymmetry measures in different tasks. It is intuitive that a lengthy career in a sport, such as baseball, emphasizing repeated asymmetrical or unilateral movements may be related of the force production asymmetries being evaluated in athletes.
- Unfortunately, the association of asymmetry measures of bilateral movements and actual sport tasks has not been evaluated. Therefore, the purpose of this study was to evaluate the association of asymmetry direction and magnitude between jumping and batting performance in collegiate baseball players.

- 13 collegiate baseball players volunteered for this study (19.9 ± 1.3 yrs, 82.2 ± 10.9 kg). All athletes participated in a dynamic warm-up focusing on all major muscle groups prior to CMJ and bat swing testing. CMJ and bat swing testing was completed on 2 adjacent PASCO 2142 force plates (Roseville, CA) sampling at 1,000 Hz. Force-time curve analyses were completed with a custom program coded in R to evaluate peak force (PF), rate of force development (RFD), and impulse (Imp) for both the CMJ and bat swing. Asymmetry magnitude was evaluated with the Symmetry Index (SI) Score ((left value – right value)/(sum of values)*100) where positive values indicate a left side asymmetry, negative values indicate a right side asymmetry, and the distance from zero indicates the asymmetry magnitude as a percentage11-12. Association between CMJ SI and bat swing SI variables were evaluated via Pearson's bivariate correlation coefficients. Interpretation of r values was done according to the scale presented by Hopkins, where: 0-0.09 is trivial, 0.10–0.29 is small, 0.30– 0.49 is moderate, 0.50–0.69 is large, 0.70–0.89 is very large, and 0.90– 1.0 is nearly perfect.

- No statistical or practical relationships were found between CMJ SI and counterpart bat swing SI variables (PF SI r = -0.240, RFD SI r = 0.024, Imp SI r = -0.002). Astatistically significant relationship between CMJ Imp SI and bat swing RFD SI was observed, but it was in the opposite direction (r = -0.518). Statistically and practically significant relationships between SI variablesof the same assessment were also present.

- Baseball is a sport that produces many repetitive movements that likely result in movement and strength asymmetries. That being said, it seems that some of this asymmetry may be task dependent. The current study did not find any statistical or practical association of force production asymmetry between CMJ and bat swing performance. In fact, some of the asymmetry measures switched direction from the CMJ to the bat swing. While force production asymmetry may be detrimental to performance of some tasks, it is important to note that asymmetry in one task may not be indicative of equal asymmetry in another. Strength and conditioning professionals should use caution if programming based upon asymmetry results of a single task.

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A pilot study: the effects of flywheel training on relative eccentric RFD in Division 1 Football

J. Collins, B. Mann, B. Wiebe, R. Cutchlow

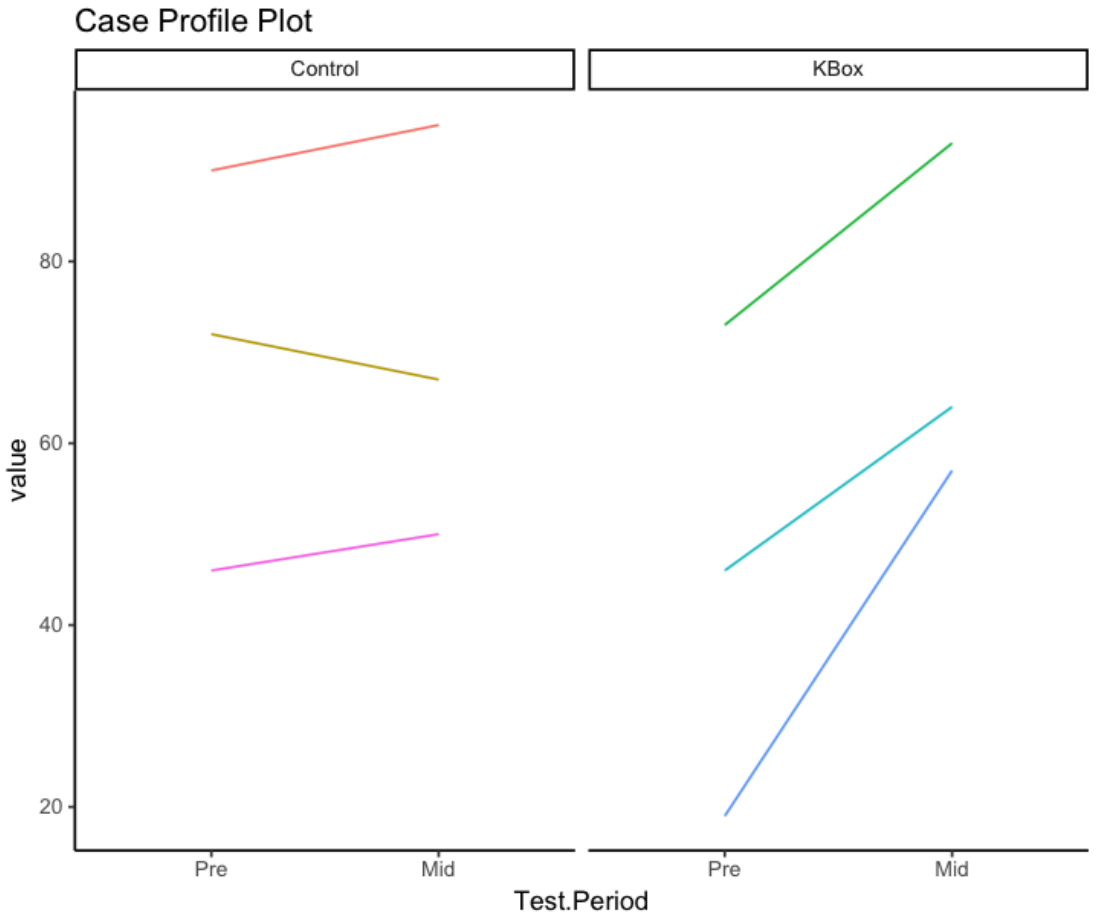
Intro

- Isoinertial Flywheel Training is becoming more popular
- What are its effects?

Methods

- NCAA Division-I Football players (n=6, age=20.14± 1.03 years, height=188.14± 6.06cm, bodyweight= 102.74± 20.44kg) were matched for position, size, and strength and split into two groups.
- Both groups participated in football team training activities for the first four weeks of the off-season training period. During this time the control group performed the prescribed team training activities while the experimental group performed squats on a flywheel trainer (3 sets x 13 reps), once per week for four weeks. The first three repetitions of each set served to initiate the fly wheel while the remaining 10 were considered “work repetitions”.
- The smallest inertial wheel was utilized.
- Athletes were instructed to maximally accelerate on the way up and resist the device on the way down.
- Evaluation of jump performance consisted of 2 countermovement jumps, both pre- and post-four weeks training, on a dual single axis force platform system to collect force-time variables and calculate discrete variables

Results


Case Profile Plot
Control
KBox
80
60
40
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value
Pre
Mid
Pre
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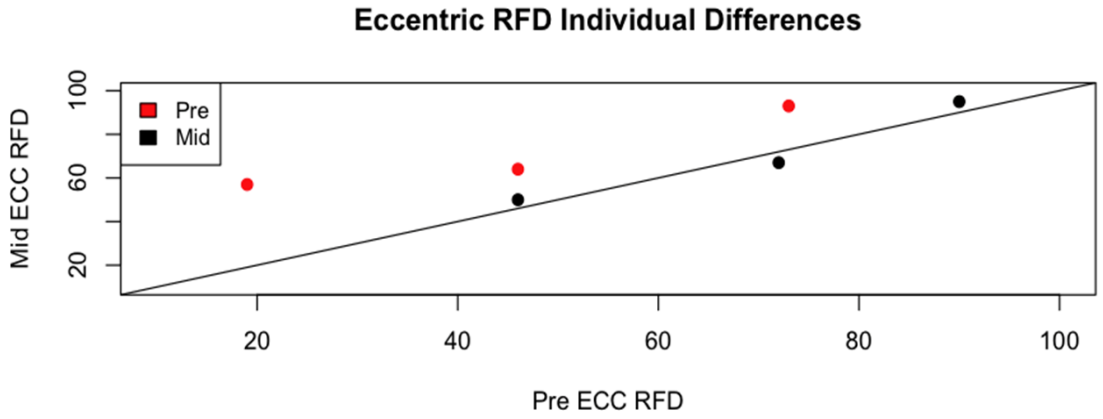
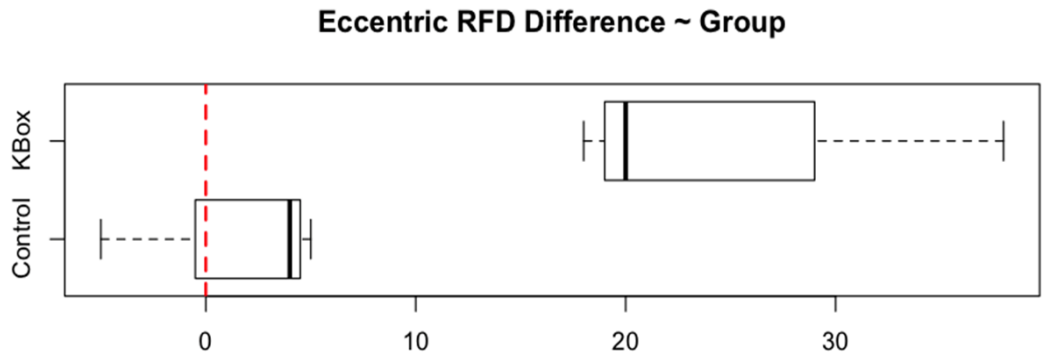
Test.Period


Eccentric RFD Individual Differences
Mid ECC RFD
Pre
Mid
20
60
100
20
40
60
80
100
Pre ECC RFD


Eccentric RFD Difference ~ Group
KBox
Control
0
10
20
30

Results

- Between and within-group effects of relative eccentric RFD were compared to threshold values established from the pre-test between subject SD (trivial (< 0.2), small (0.2 – 0.6), moderate (0.6 – 1.2), large (1.2 – 2.0), and very large (> 2.0) (Batterham & Hopkins)).
- The probability distribution of the effect was interpreted as “clear” if the probability likelihood of the effect was ≥ 75% (Barrett et al., 2018). Isoinertial Flywheel training led to a most likely moderate increase (25.3; SD ± 11.0) in relative eccentric RFD while the observed difference in the control group was unclear (1.3; SD ± 5.5).
- Between-group differences suggest that isoinertial flywheel training led to a likely moderate increase (24; 90% CL ± 23) in relative eccentric RFD compared to the control group.

Conclusions

- An intervention of isoinertial flywheel squats performed once per week (3x10) appears to be an effective means of enhancing relative eccentric RFD in four week time periods for division one football players.
- Given the small sample size of this preliminary report, more data is required to have greater confidence in the observed effects.

Practical Application

- Utilizing flywheel training on squats for a single session of 3x13 (10 working repetitions) per week seems to be enough to elicit an increase in eccentric RFD in this pilot study. However, further research is needed with a larger sample size to gain certainty.
- Further research needs to be performed to see the impact of different modes of application (intensity, total workload, etc).