Unilateral leg strength: relevant to Rugby League speed?

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Rugby League: Speed

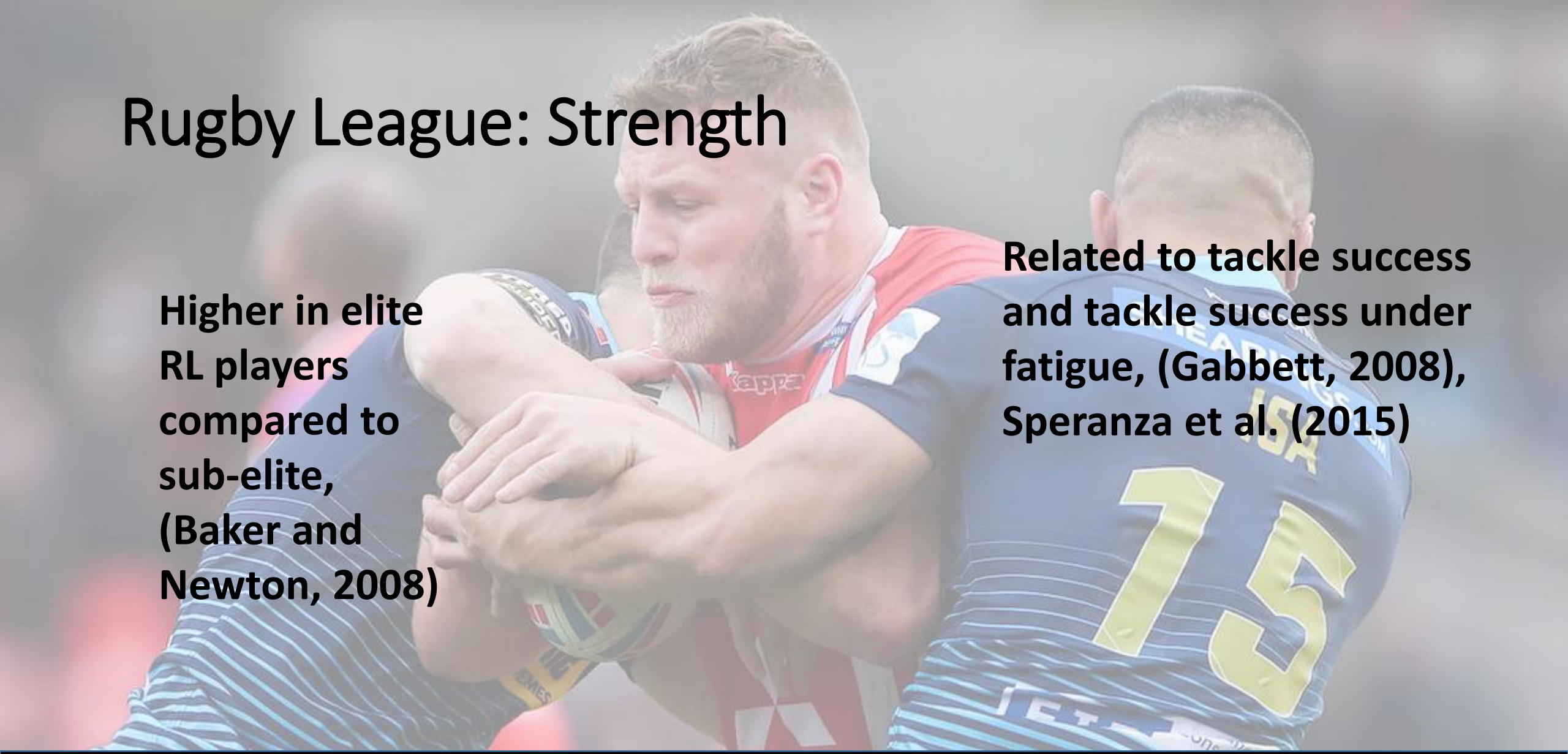
67.5% Sprints are between 6m and 20m Gabbett (2012)

Total number of high intensity accelerations 79.5±8, Gabbett (2013)

Mean maximum velocity 9.0±1.03m/s for backs and 8.47±0.7m/s, McLellan and Lovell (2013)

Gabbett (2012) total sprints per game as, 36.5±9.3

Rugby League: Strength



Higher in elite RL players compared to sub-elite, (Baker and Newton, 2008)

Related to tackle success and tackle success under fatigue, (Gabbett, 2008), Speranza et al. (2015)

Strength and Linear Speed

Strong correlations between 1RM BS and 10m (r = -0.94) , Wisløff et al. (2004).

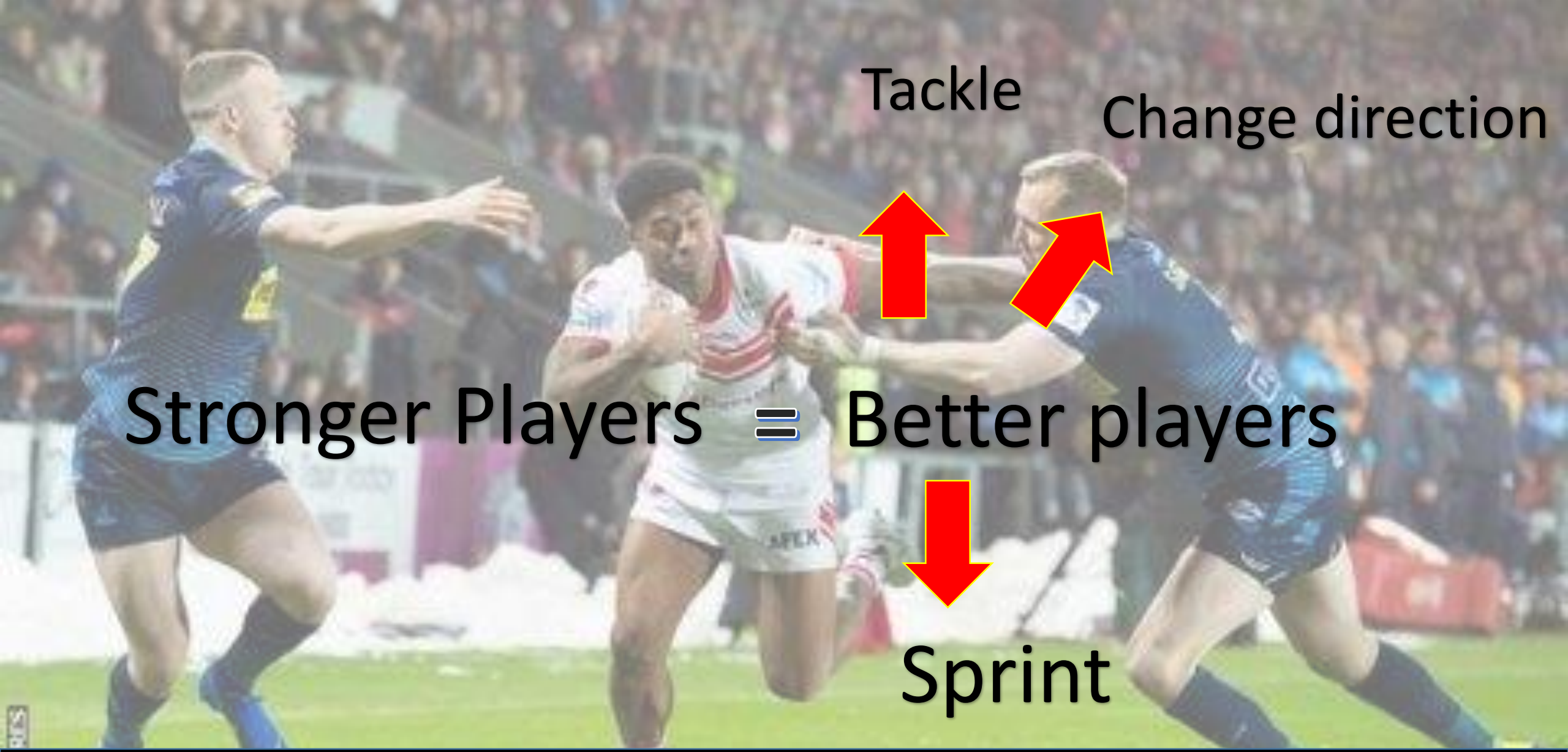
Significant increases were observed in changes in absolute and relative strength ($p<0.001$), Comfort et al. (2012), Keiner et al. (2014) .

Strength gains correlated with sprint performance (r = 0.6 – 0.78), Styles et al. (2016).

Strength and Change of direction speed

Leg Strength ↑ COD Time ↓

(1RM BS (Bourgeois Ii et al., 2014), 3RM BS (McCormick et al., 2014), IMTP (Spiteri et al., 2014, Thomas et al., 2018),


Tackle
Change direction
Stronger Players = Better players
Sprint

Unilateral leg strength: relevant to Rugby League speed?

- *It was hypothesized that unilateral leg strength would correlate with performance in sprint and CODS measures.*

Experimental approach

- Unilateral Leg strength (asymmetry)
  - Rear foot elevated split squat (RFESS) five repetition maximum (5RM)
  - Validated by McCurdy et al (Strength) and Helme et al (asymmetry) (Under review)
- Linear Speed
  - Standing 20m sprint (0-10m, 10m-20m Splits)
  - Time, mean velocity, momentum
- Change of direction speed
  - Modified 5-0-5 test
    - Time, change of direction deficit

Participants

- With institutional ethical approval, 78 subjects were recruited from three RL teams. When exclusion criteria were applied (free from injury for six weeks prior to testing and available to attend both test dates) 28 were removed and 50 subjects were retained for testing.
  - Post-hoc power analysis (G*power) found a 68% probability for an effect size of 0.5 and alpha level of error of 0.05, for this sample size.

	Elite academy (n=32)	Semi-professional (n=18)	Whole Group (n=50)
Age (years)	17.3 ± 1	25.3 ± 5.3	20.71 ± 5.1
Mass (kg)	85.6 ±11.5	92.7 ±9.6	88.2 ±11.2
Height (m)	1.81 ± 0.1	1.83 ± 0.1	1.82 ± 0.1

Rear Foot Elevated Split Squat 5RM

- Review of the validity and reliability of the RFESS 5RM as a measure of leg strength symmetry
  - Paper currently under review (JSCR)
- Bar loads between test and re-test conditions a most likely very large positive correlation (r =0.93, CL 0.88-0.96) and an excellent level of reliability was found (ICC = 0.93 CL 0.88-0.96).

Mean symmetry (all trials)	Standard error of the mean	Mean symmetry (test 1)	Mean symmetry (test 2)	ICC (95% confidence interval)
102.15± 7.95%	1.29%	99.67 ±18.77%,	102.84 ± 6.35%)	0.73, 0.39-0.89

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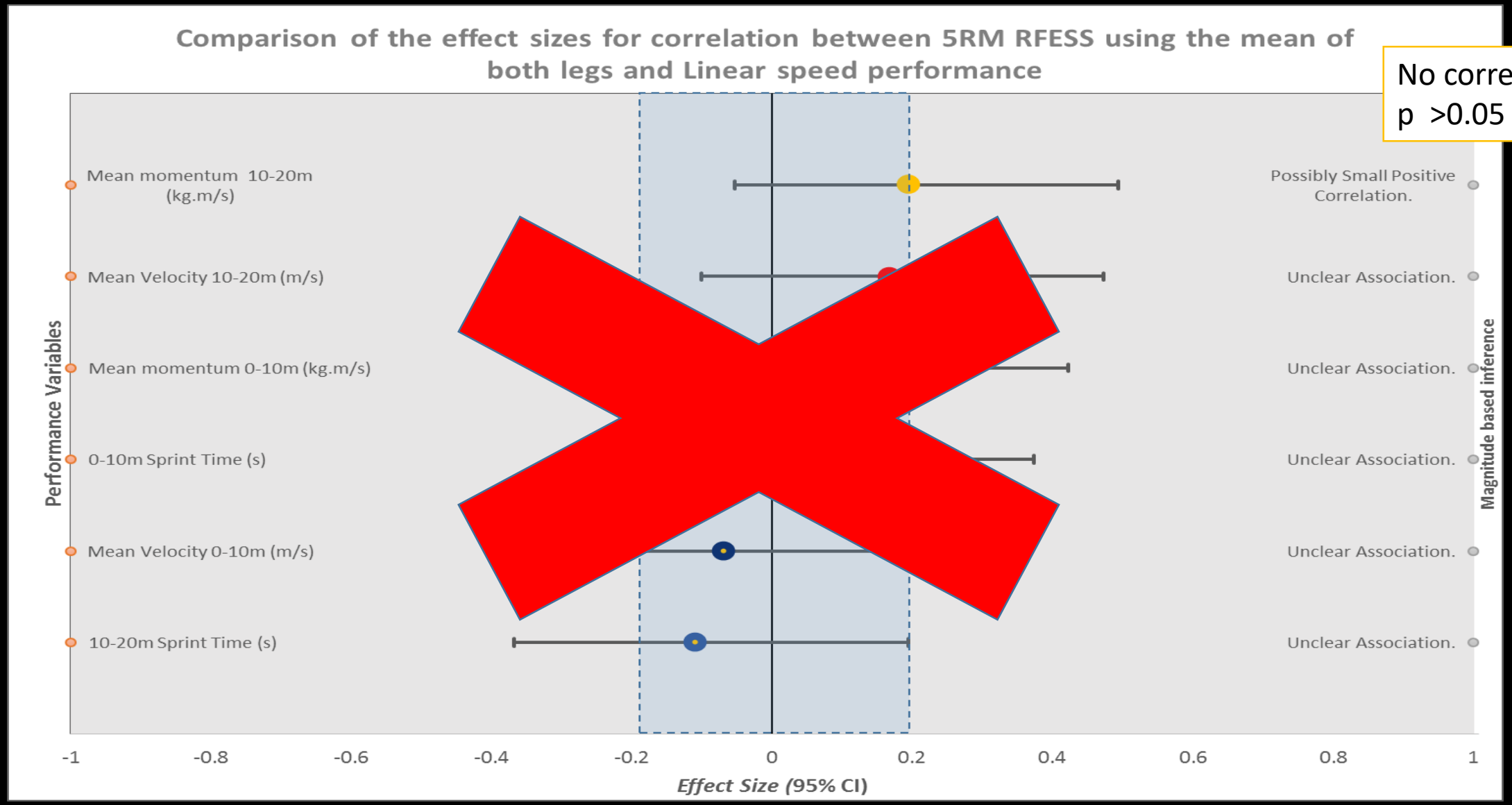

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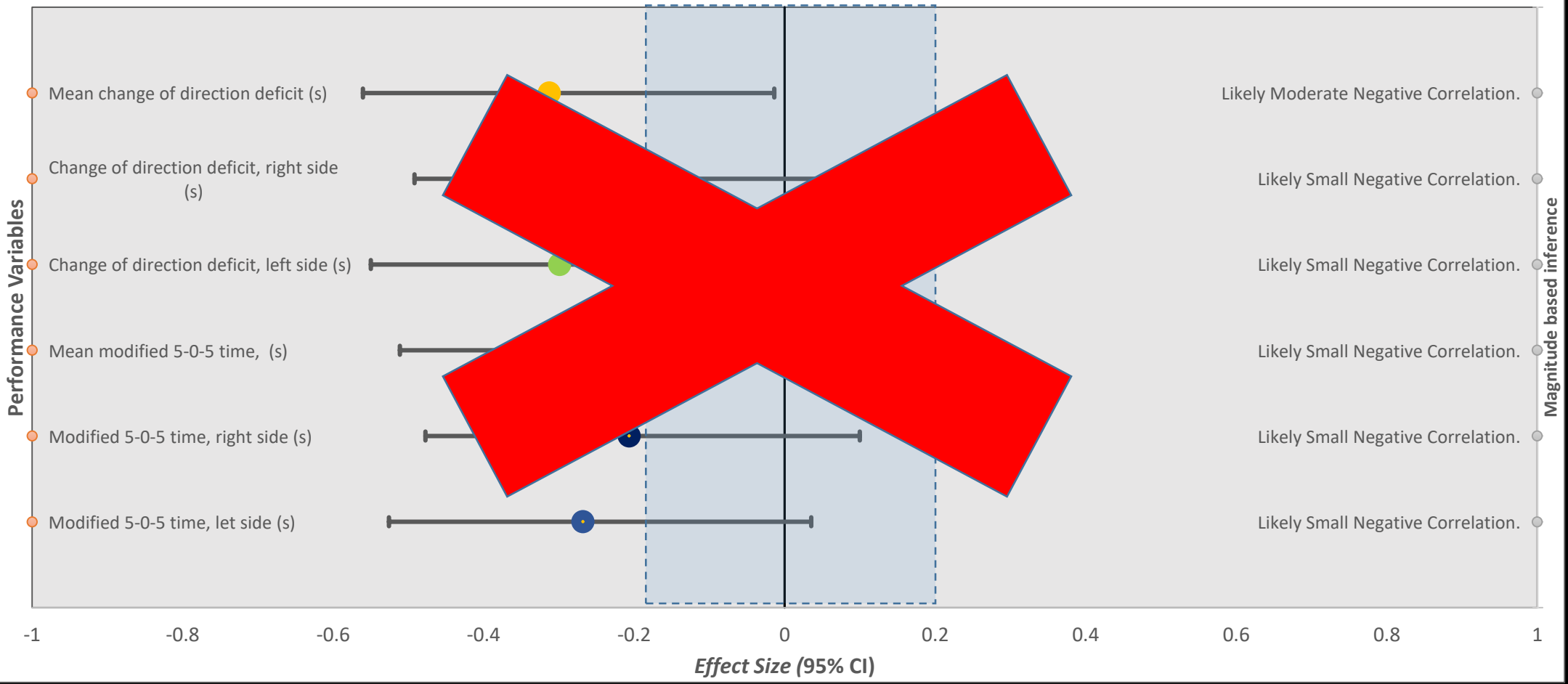
Comparison of the effect sizes for correlation between 5RM RFESS using the mean of both legs and change of direction speed performance

No correlation
p >0.05



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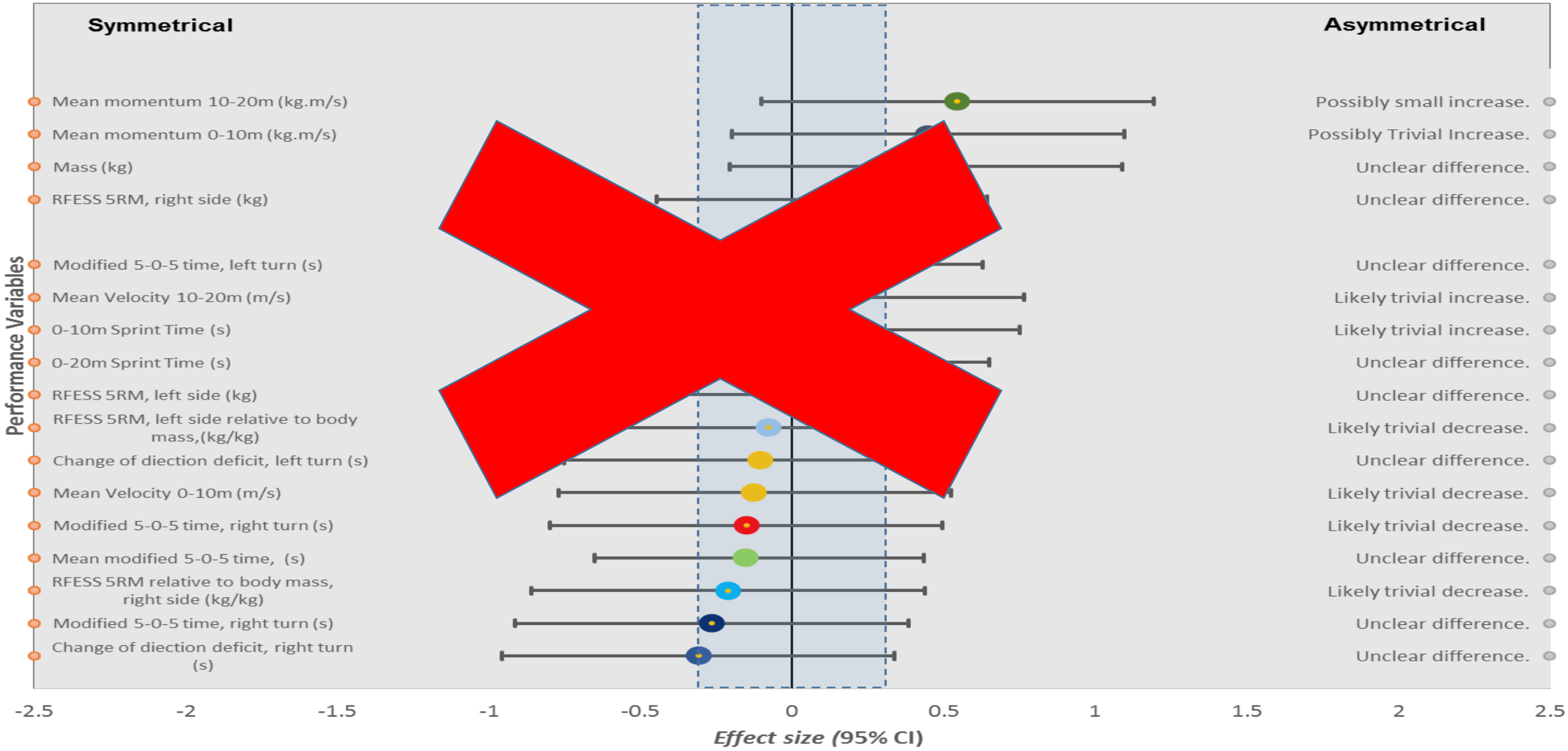

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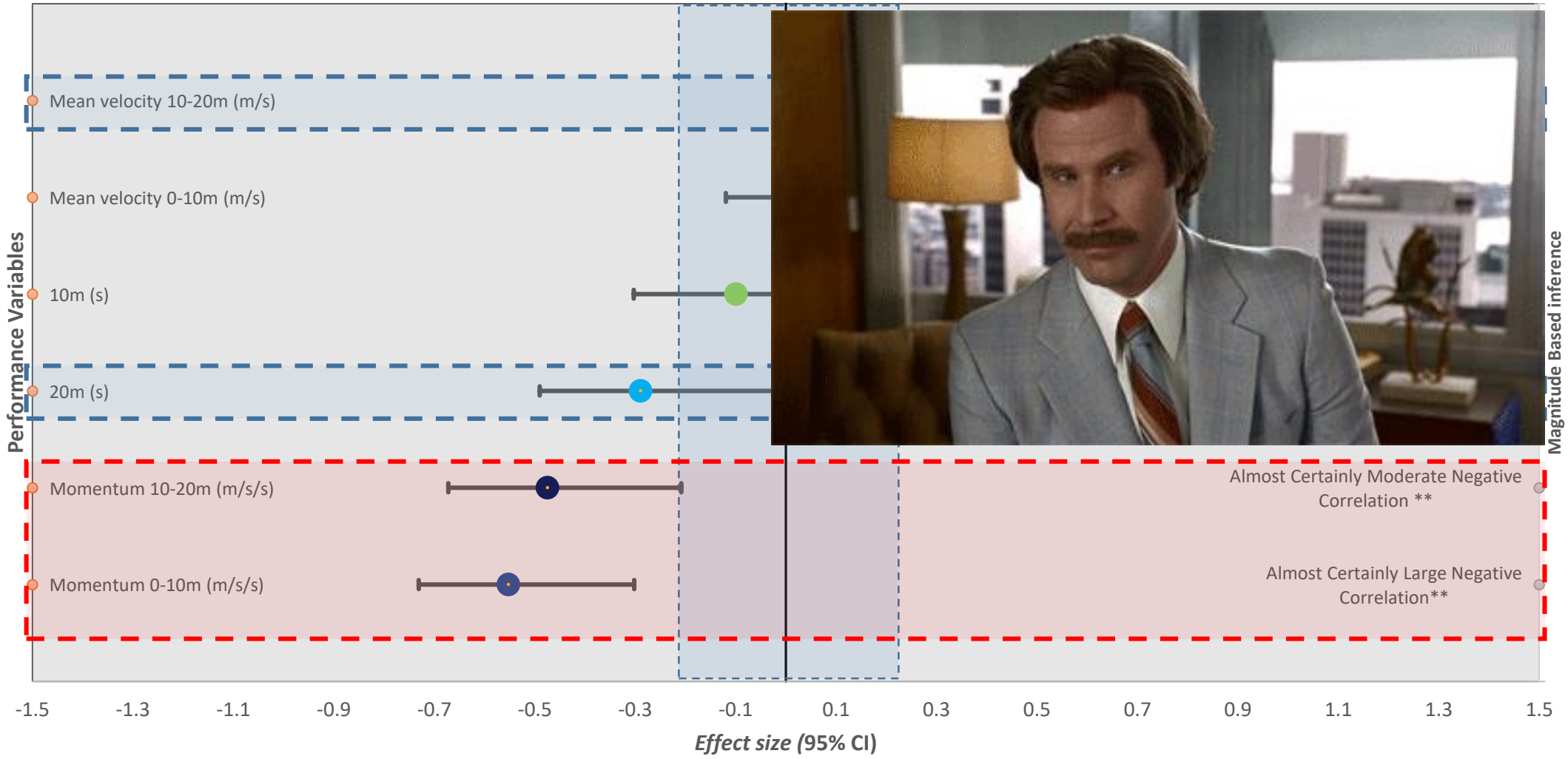
Comparison of the effect sizes for correlation between 5RM RFESS, relative to body mass, using the mean of both legs and linear speed performance



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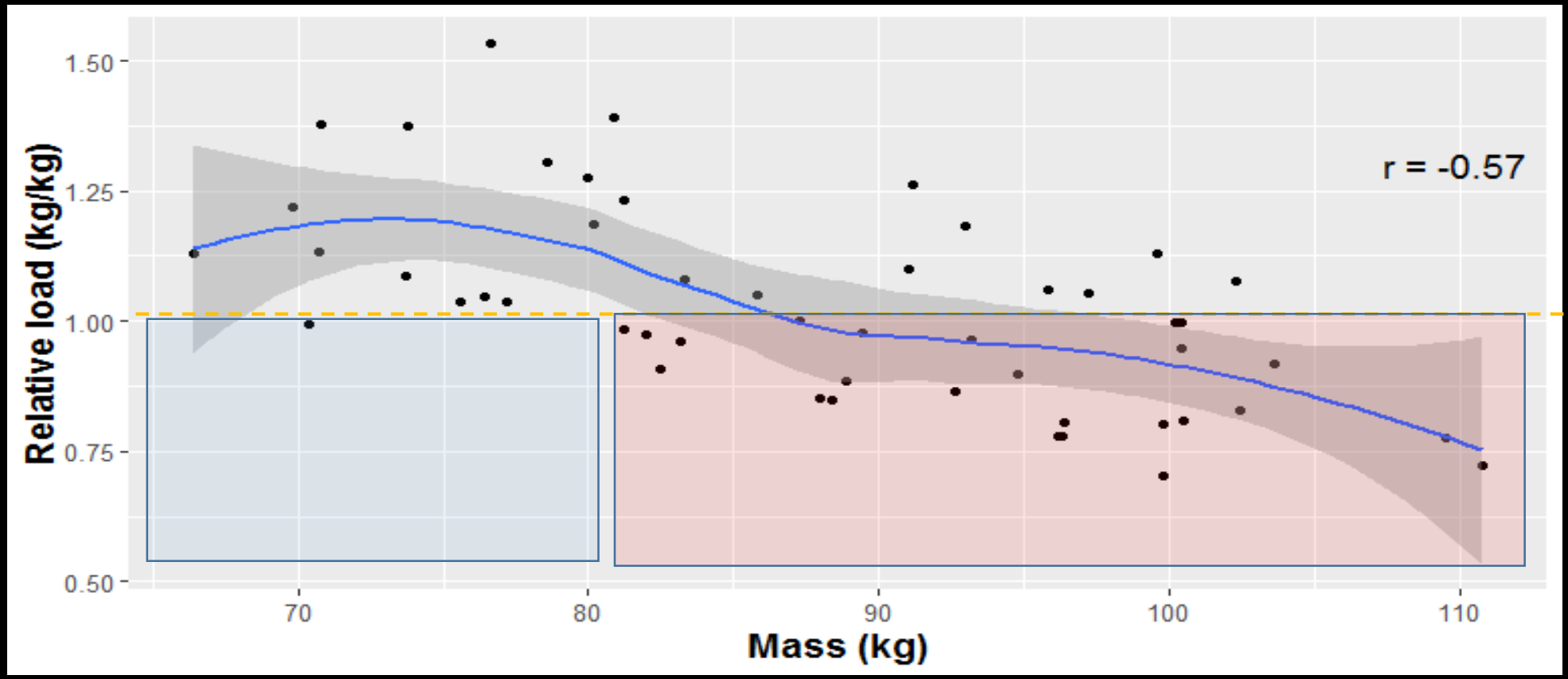
The relationship between body mass and mean unilateral leg strength, relative to body mass.



Almost Certainly Large Negative Correlation, p = >0.01

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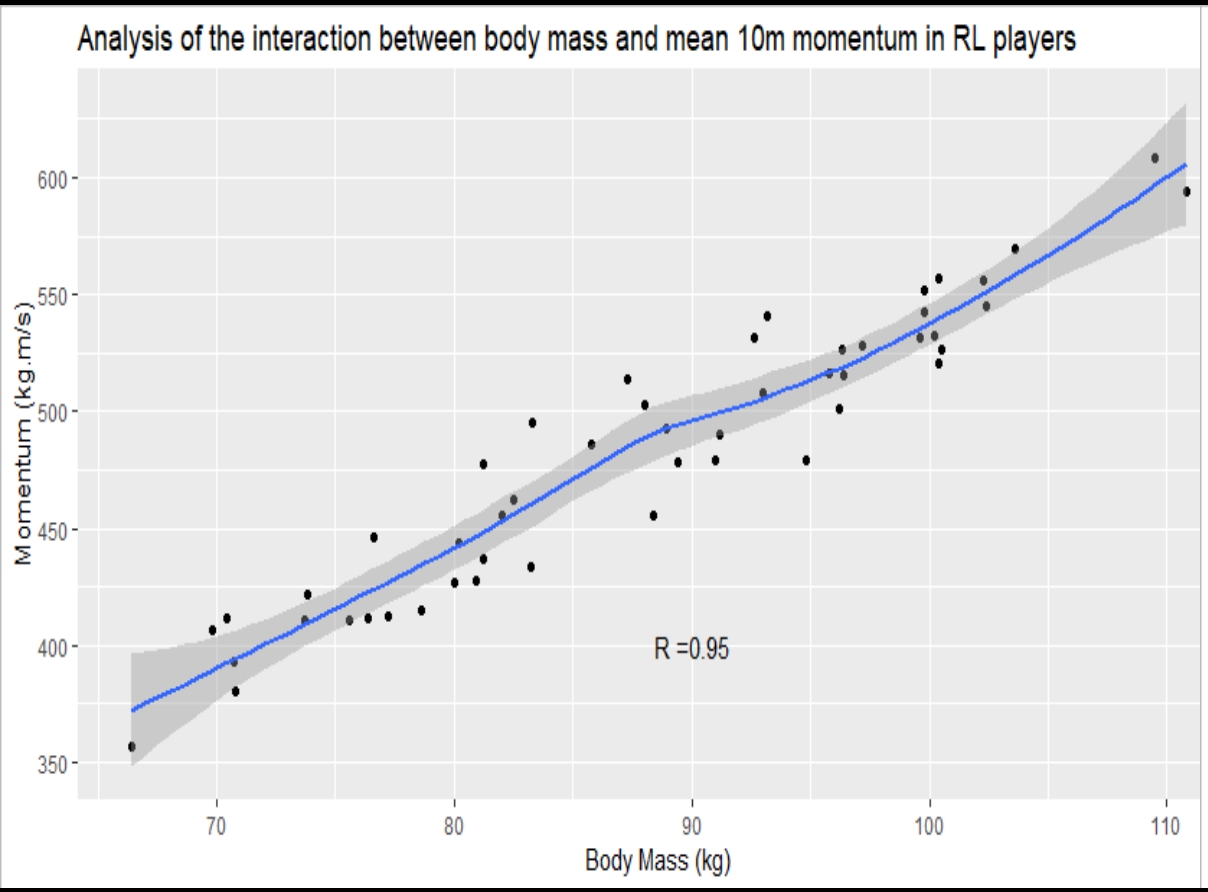

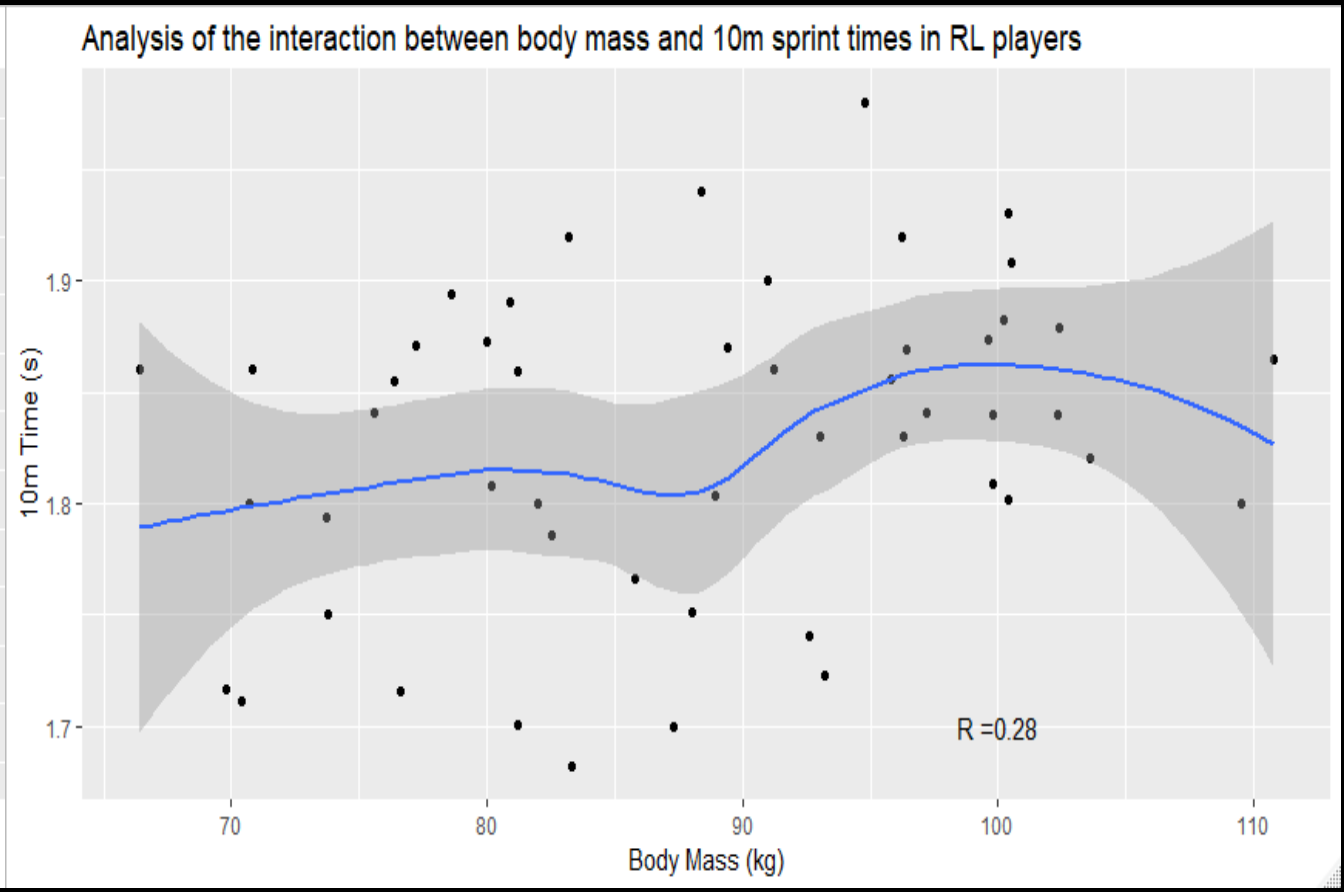

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Conclusions and applications

- Absolute unilateral strength was not found to be associated with either linear or CODS.
- Relative unilateral leg strength is associated with improved CODS and linear sprint speed.
- Momentum was negatively linked to relative strength
  - Lighter people were stronger.
- Elite players are heavier than sub-elite and academy players.
- Heavier players (forwards) need to increase relative strength, to that of or greater than lighter (backs) players
  - Reduce fat mass
  - Increase lean tissue
  - Increase absolute strength.

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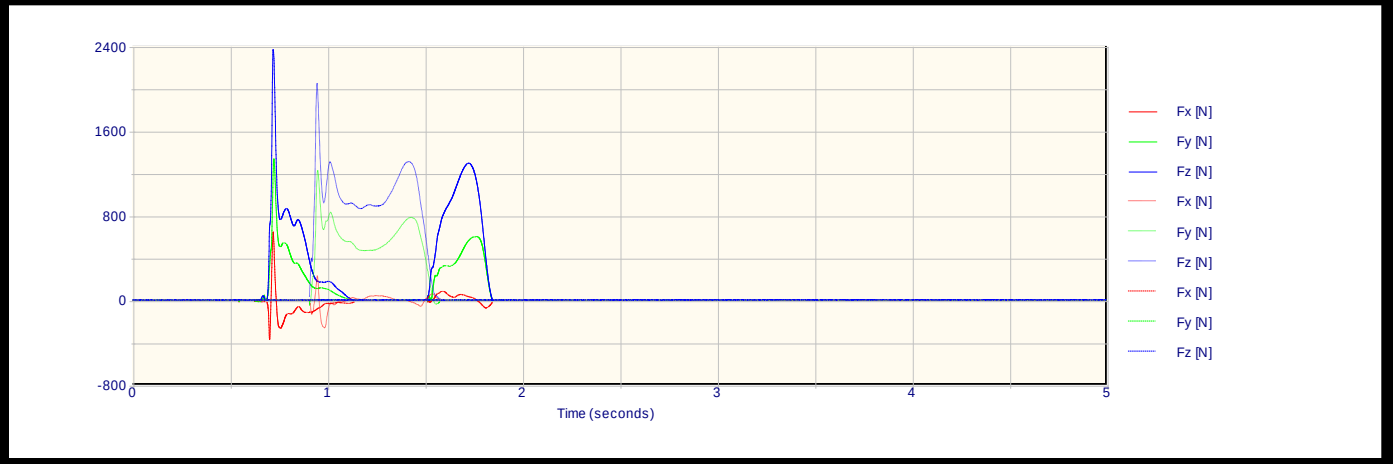
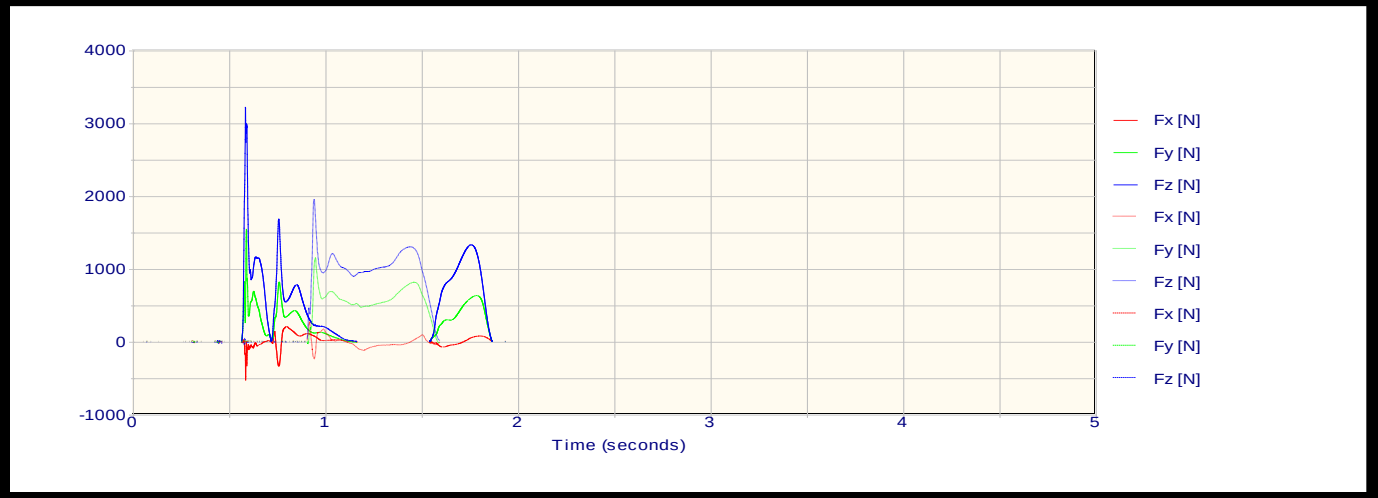
Future directions and research





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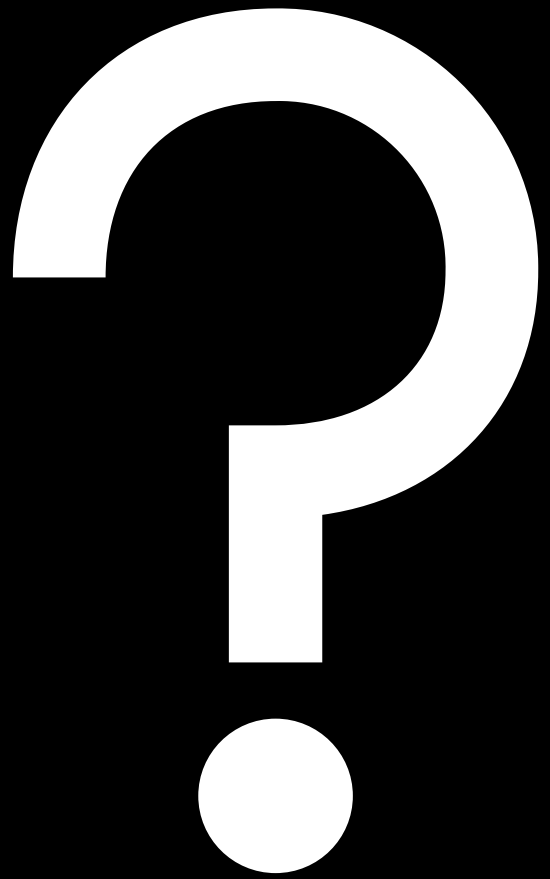

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