NON-DOMINANT HAND GRIP STRENGTH MEDIATES PEAK FORCE OUTPUT IN ISOMETRIC MID-THIGH PULL: THE INFLUENCE OF LIFTING STRAPS

Jeremy A. Ross♯, Elizabeth A. Perrero♯, Jonathan D. Martin♯, Jamal L. Thruston#, Nicholas R. Heebner♯

♯University of Kentucky Sport Medicine Research Institute, Lexington, KY

INTRODUCTION

- Isometric Mid-Thigh Pull (IMTP) is a reliable, simple, and relatively quick assessment of force generation capacity.
- Little is known about the relative contribution of grip strength in IMTP net peak force (NPF).
- To counteract the effect of handgrip strength, many studies employ lifting straps.
- Research is lacking in the exploration of strapped and unstrapped grip variations and their effect on NPF.

PURPOSE

Assess intercorrelations of strapped vs unstrapped grips on IMTP net peak force (NPF) and determine the relative contribution of hand grip strength.

METHODS

Table 1. Subject Demographics

Total Subjects	Male/Female	Age	Mass	Height	Training Age
29	9/20	30.3±6.9 yrs	77.1±10.9 kg	171.1±3.3 cm	med: 5.5 yrs

SUBJECTS (Table 1)
- 29 healthy subjects (9 males)
- Physically active adults (NASA Physical Activity Scale ≥6)
- No chronic musculoskeletal complaints

PROTOCOL
- Grip strength (3 trials each hand)
  - Stronger hand (DOM)
  - Weaker hand (nDOM)
  - Average of both hands
- One strapped and one unstrapped condition each day
  - Two days ~48 hours apart
  - Conditions randomized, counterbalanced

PROTOCOL (con't)
- Four IMTP conditions (Figure 1)
  - Pronated, unstrapped (PRO)
  - Mixed, unstrapped (MIX)
  - Traditional straps (TRAD)
  - Figure 8 straps (F8)

STATISTICAL ANALYSIS
- Spearman rank correlations
- Stepwise linear regression to determine predictors of PRO NPF
  - NPF from MIX, TRAD and F8
  - Grip strength variables
- Mediation analysis of regression models
- Alpha level of $p<0.05$

RESULTS

- Strong to very strong NPF correlations between all IMTP conditions ($r= 0.89 – 0.92$)

- NPF was strongly correlated with grip strength ($r= 0.80 – 0.87$) across all conditions.

- Stepwise linear regression identified TRAD NPF and nDOM grip strength as significant predictors of pronated, unstrapped NPF ($r^2=0.888$).

- Mediation analysis revealed that nDOM grip strength significantly mediated the relationship between strapped and unstrapped NPF
  - (ACME = 0.302, 95% CI [0.13, 0.52], p = 0.0016).
  - The proportion of the total effect mediated by grip strength was 46% (95% CI [20.0%, 73.0%]).
  - The direct effect of strapped NPF on unstrapped NPF remained significant (ADE = 0.348, 95% CI [0.177, 0.580], p = 0.0020).

Figure 1. Grip variations
Unstrapped pronated (PRO, top left), unstrapped mixed (MIX, top right), traditional strapped (TRAD, bottom left), figure-8 straps (F8, bottom right)
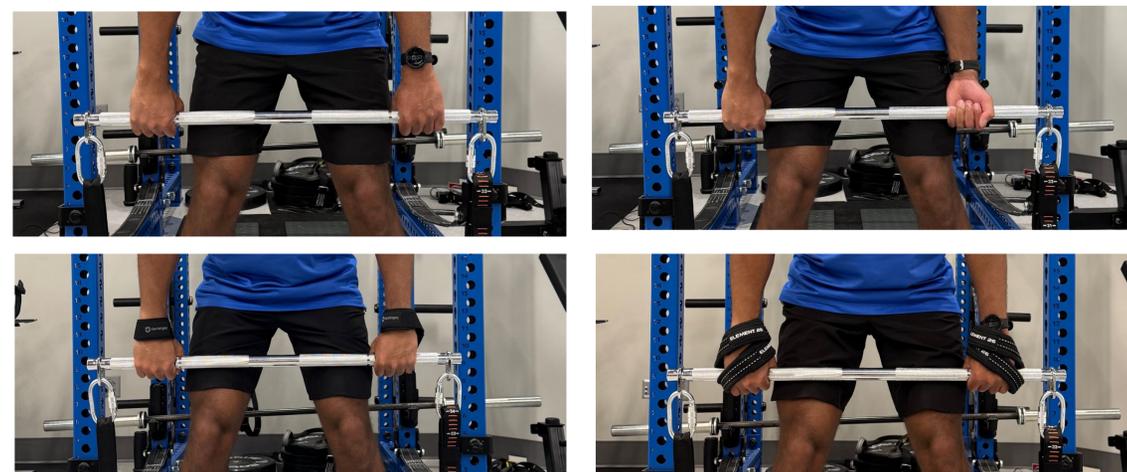
Table 2. Correlations of Grip Strength and IMTP

Variable	DOM Grip	nDOM Grip	Mean Grip
Pronated Grip (PRO)	.756	.869	.864
Mixed Grip (MIX)	.724	.854	.827
Traditional Straps (TRAD)	.714	.846	.835
Figure 8 Straps (F8)	.731	0.804	.789

CONCLUSIONS

- Grip strength is strongly correlated with IMTP NPF across all conditions
- Non-dominant grip strength is more strongly correlated with unstrapped IMTP NPF than dominant grip strength or average grip strength of both hands.
- Unstrapped NPF is mediated by non-dominant grip strength
  - Explains 81.2% of the variance in pronated, unstrapped IMTP
- Approximately half (46-54%) of the total effect of strapped NPF on unstrapped NPF is explained by grip strength of the non-dominant hand.

PRACTICAL APPLICATIONS

- Strapped and unstrapped IMTP NPF are strongly correlated, suggesting that unstrapped IMTP could identify group rankings.
- Non-dominant grip strength is a significant mediating factor in unstrapped IMTP performance.
- Lifting straps help quantify total pulling strength from an IMTP.

ACKNOWLEDGEMENTS