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Introduction

The U.S. Army recently implemented a new occupational fitness test, the Army Combat Fitness Test (ACFT). The original ACFT was met with widespread controversy due to the inclusion of the leg tuck (LTK). The LTK was intended as a proxy measure of a Soldier's ability to climb a rope or scale an obstacle (i.e., a testable measure of upper body pulling and core strength); however, a disproportionate number of female soldiers had suboptimal LTK performance. In 2022, the LTK was replaced by the plank (PLK). While the PLK would test core endurance, the relationship to pulling strength is tenuous at best. It is unclear if the transition from the LTK to the PLK was due to a decision to emphasize core strength and endurance, implement a more equitable event based on the notable performance differences between males and females, or provide an event that closely aligns with combat or soldiering tasks.

**Purpose:** To determine the relationship between the LTK and PLK with pullups (PUP) and handgrip strength (HGS) between male and female Soldiers.

Methods

Forty-one (23 males, 18 females; age: 30.1 ± 6.5 years, height: 171.1 ± 9.2 cm, weight: 76.1 ± 16.1 kg) Army personnel completed the study. Each participant was required to complete visit 1, a maximum effort HGS and PLK assessment, and visit 2, a randomized maximum effort PUP and LTK assessment. A visual representation of the study design is displayed on Figure 1.

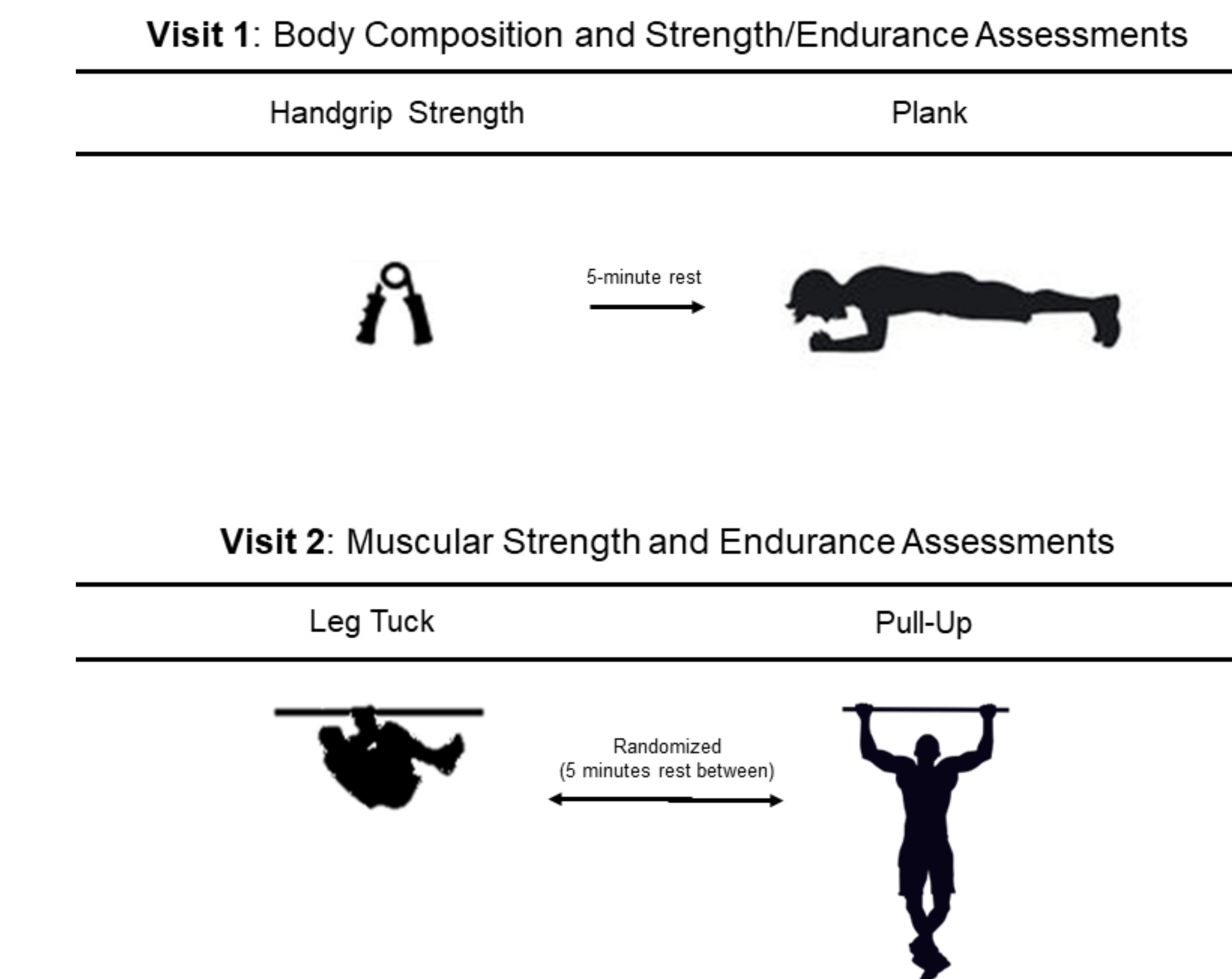


Figure 1. Schematic representation of the experimental sessions.

Descriptive statistics were calculated for all variables (mean ± SD). Independent samples t-tests calculated between sex differences. Overall correlations were reported with and without sex as a covariate. Correlations were interpreted according to the thresholds developed by Cohen. A stepwise linear regression, controlling for sex, determined which variables predicted LTK and PLK performance. Significance was set *a priori* as  $p < .05$ .

There were **substantial** sex differences in **LTK** and **PLK** performance

**Only LTK performance was correlated with upper-body pulling or handgrip strength**

**ACFT scores are normalized by sex, thus event selection should be based on associations with combat or soldier tasks**

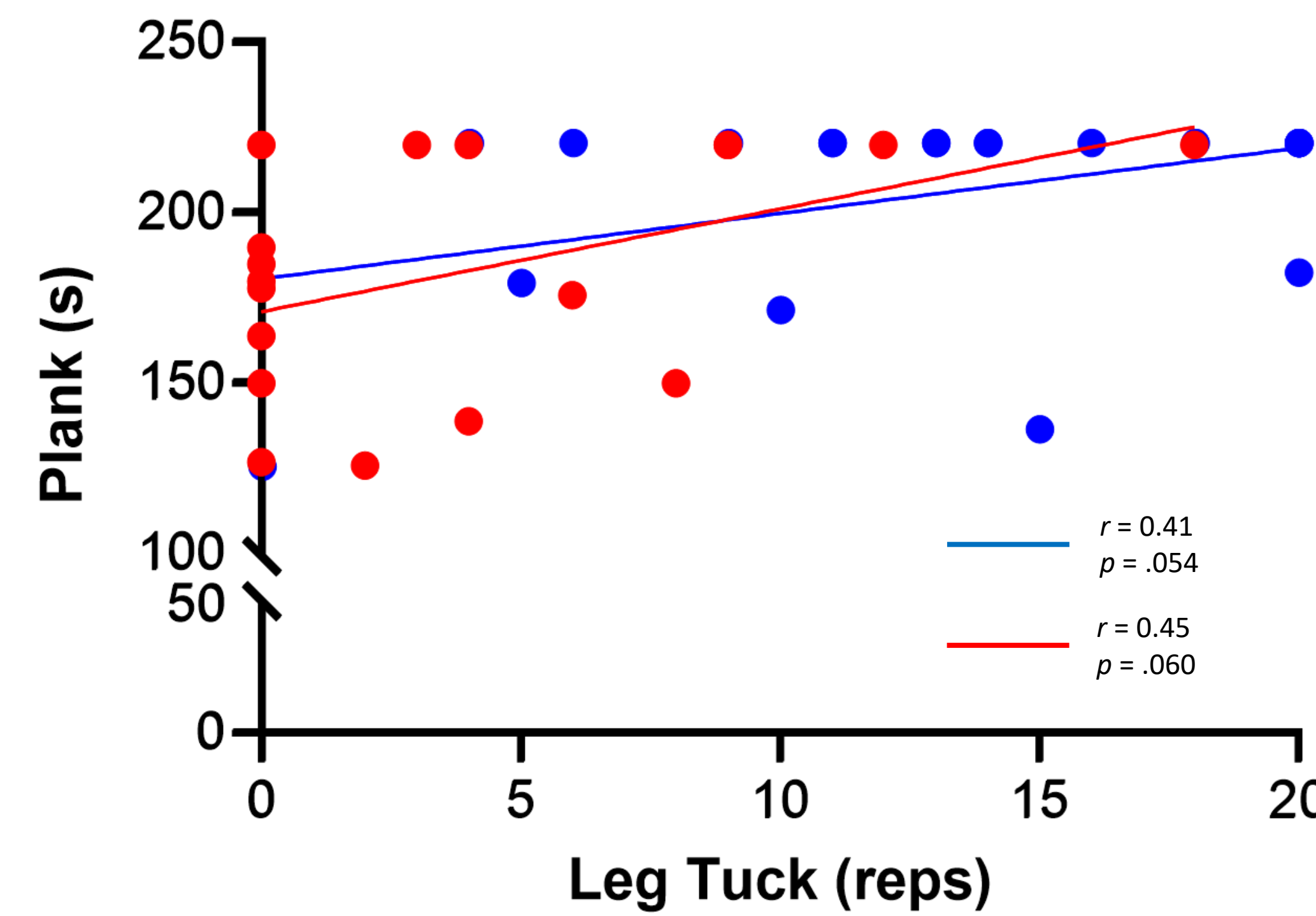


Figure 2. Correlation between LTK and the PLK in male (blue dots) and female (red dots) Army personnel.

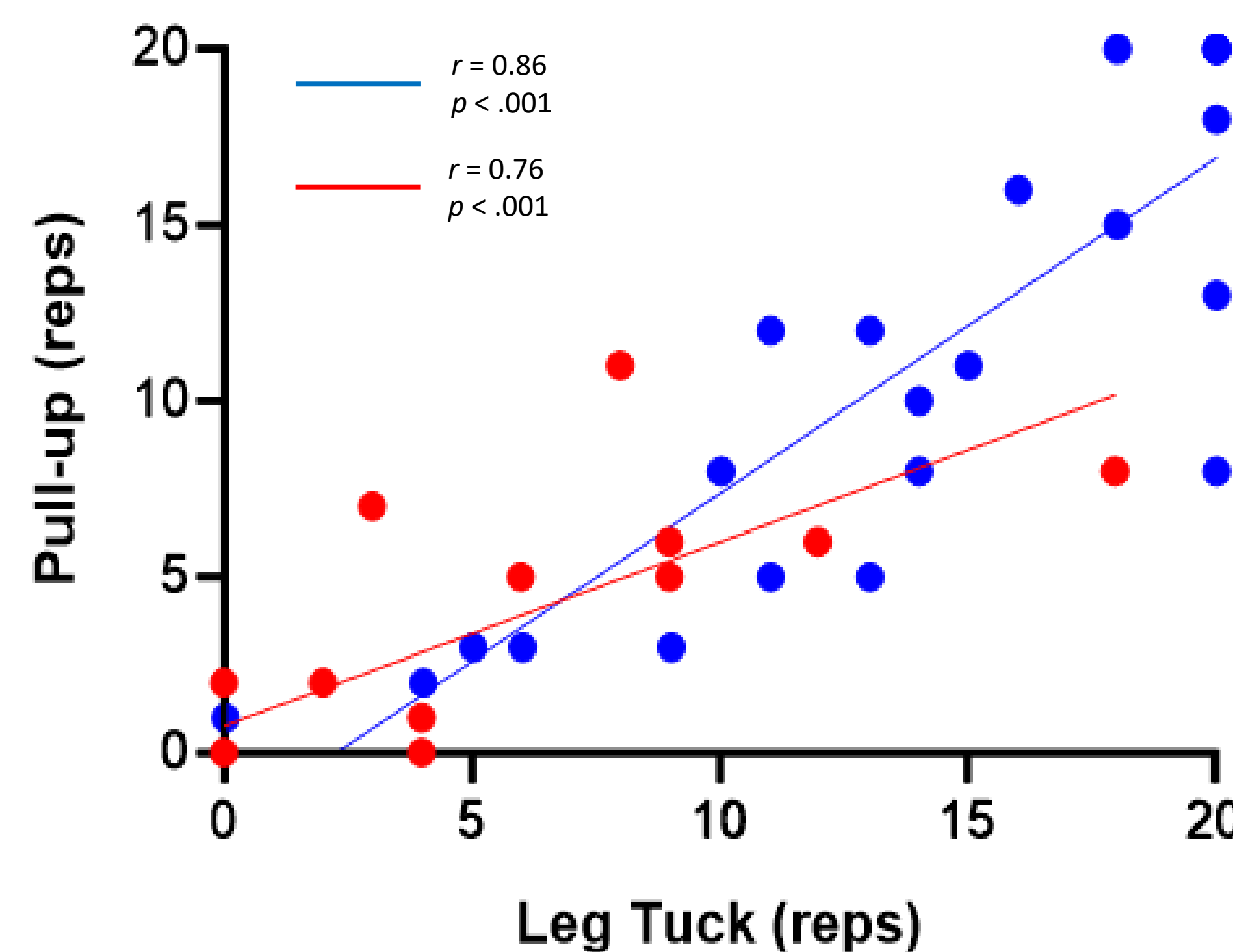


Figure 3. Correlation between LTK and the PUP in male (blue dots) and female (red dots) Army personnel.

Results

Table 1. Participant characteristics (n = 41)

	Total	Male	Female	p-value
Age (y)	30.1 (6.5)	30.6 (7.5)	29.4 (5.2)	.578
Height (cm)	171.1 (9.2)	176.0 (7.1)	164.9 (7.9)	< .001
Weight (kg)	76.1 (16.1)	83.6 (15.3)	66.5 (11.7)	< .001
BMI (kg/cm <sup>2</sup> )	25.8 (4.0)	26.9 (3.8)	24.4 (3.9)	.049
HGS (kg)	105.5 (35.3)	129.5 (27.4)	74.8 (13.7)	< .001
PLK (s)	196.5 (33.0)	206.7 (28.2)	183.6 (34.8)	.024
LTK (reps)	9.6 (7.4)	13.8 (6.0)	4.2 (5.2)	< .001
PUP (reps)	7.5 (6.8)	11.0 (6.7)	2.9 (3.5)	< .001

Male soldiers had higher HGS (mean difference [MD] = 54.7 kg), longer PLK times (MD = 23.0 s), more LTK (MD = 9.6 reps) and PUP (MD = 8.1 reps) repetitions compared to female soldiers.

Leg tuck and PLK performance were strongly correlated ( $r = 0.53$ ,  $p < .001$ ). When controlling for sex, this effect was attenuated ( $r = 0.42$ ), but remained significant ( $p = .007$ ). With sex as a covariate, LTK was moderately and strongly correlated to HGS ( $r = 0.42$ ,  $p = .008$ ) and PUP ( $r = 0.82$ ,  $p < .001$ ), respectively. Conversely, PLK performance was not correlated with HGS ( $r = 0.11$ ,  $p = .516$ ) or PUP ( $r = 0.30$ ,  $p = .064$ ). Correlations based on sex between LTK and PLK/PUP are presented on Figure 2 and 3, respectively.

Based on the stepwise regression, 80.9% of the variance in LTK performance was explained by sex and PUP ( $p < .001$ ). The addition of HGS did not change the model (F change  $p = .871$ ). For the PLK, 12.3% of the variance in performance was explained by sex ( $p = .024$ ); however, adding PUP and HGS did not significantly change the model.

Conclusion

Male soldiers outperformed female soldiers on the PLK and LTK. Both LTK and PLK performance was influenced by sex; whereas, only the LTK was related to upper body pulling strength as measured by PUP.

Practical Applications

Since the Army accounts for sex differences on performance via differential scoring, ACFT events should be selected, primarily, on events that align most closely with soldiering and combat tasks. As indicated by the initial ACFT justification, upper-body pulling strength represents an important component that is currently not represented in the ACFT. Analysis of the included events should be on-going and reflect those movements most relevant to military-associated tasks.

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