



Handgrip Forces and Stretcher Carriage - Insights into Potential Limits of Trainability

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Even in our high-tech armed forces, manual lifting and carrying of loads are still core demands of soldiering. In this context, transporting a casualty on a stretcher is a prime example for a challenging occupational task that primarily depends on handgrip strength. However, handgrip strength and thus performance may vary considerably due to influence of gender and training. Aim of the study was the preliminary assessment of the influence of gender on performance and recovery and to estimate maximal trainability of women by comparing strength data with results from more than 2,000 healthy adults with data from highly trained female athletes.

Methods:

Stretcher carriage tests (with a stretcher mock-up) were performed with both hands until exhaustion on a treadmill (velocity 4.5 km/h, mean load at handles 245 N (25 kg)). Isometric handgrip strength was measured over 15 s pre-test and at fixed post test intervals to capture recovery kinetics. Maximal (F_{max}) and mean handgrip force (F_{mean}) were derived from the 15 s force tracings.

Results/Discussion:

1) Effects of gender

Male performance (184 s) was almost double over females (98 s). Maximal handgrip strength was decreased by 25 % (men) and 14 % (women) immediately post exhaustion. Complete recovery of handgrip strength required up to 72 h. Slow force recovery was probably caused by eccentric strains due to vertical oscillations and subsequent muscle damage.

2) Influence of gender and margins for trainability

F_{max} (men: 541 N; women: 329 N) and F_{mean} (men: 461 N; women: 278 N) differed significantly between genders. Gender related distribution showed only a marginal overlap: 90 % of the women did not attain the maximal handgrip strength of the 5th percentile (398 N) of male volunteers. Female athletes ($n=60$) were able to attain mean F_{max} corresponding to the 15th percentile of the male control group indicating an unbridgeable gap despite longtime and intensive training