

Sex-Specific Differences in Fatigability During Bilateral Vs Unilateral Maximal Isometric Exercise to Task Failure

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INTRODUCTION

Women are typically less fatigable than men during submaximal isometric exercise to task failure. However, the prevailing mechanisms and functional consequences related to differences in sex-specific fatigability have not been fully elucidated. Some evidence suggests that differences in fatigability between men and women depends on the intensity of contraction during isometric exercise. Further, independent of sex, it has been suggested that the total muscle mass utilized (i.e., bilateral vs unilateral) during exercise influences fatigability.

PURPOSE

The purpose of this study was to identify the effects of unilateral versus bilateral contractions on time to task failure (TTF) between men and women during fatiguing maximal isometric voluntary contractions (MVIC) of the leg extensors.

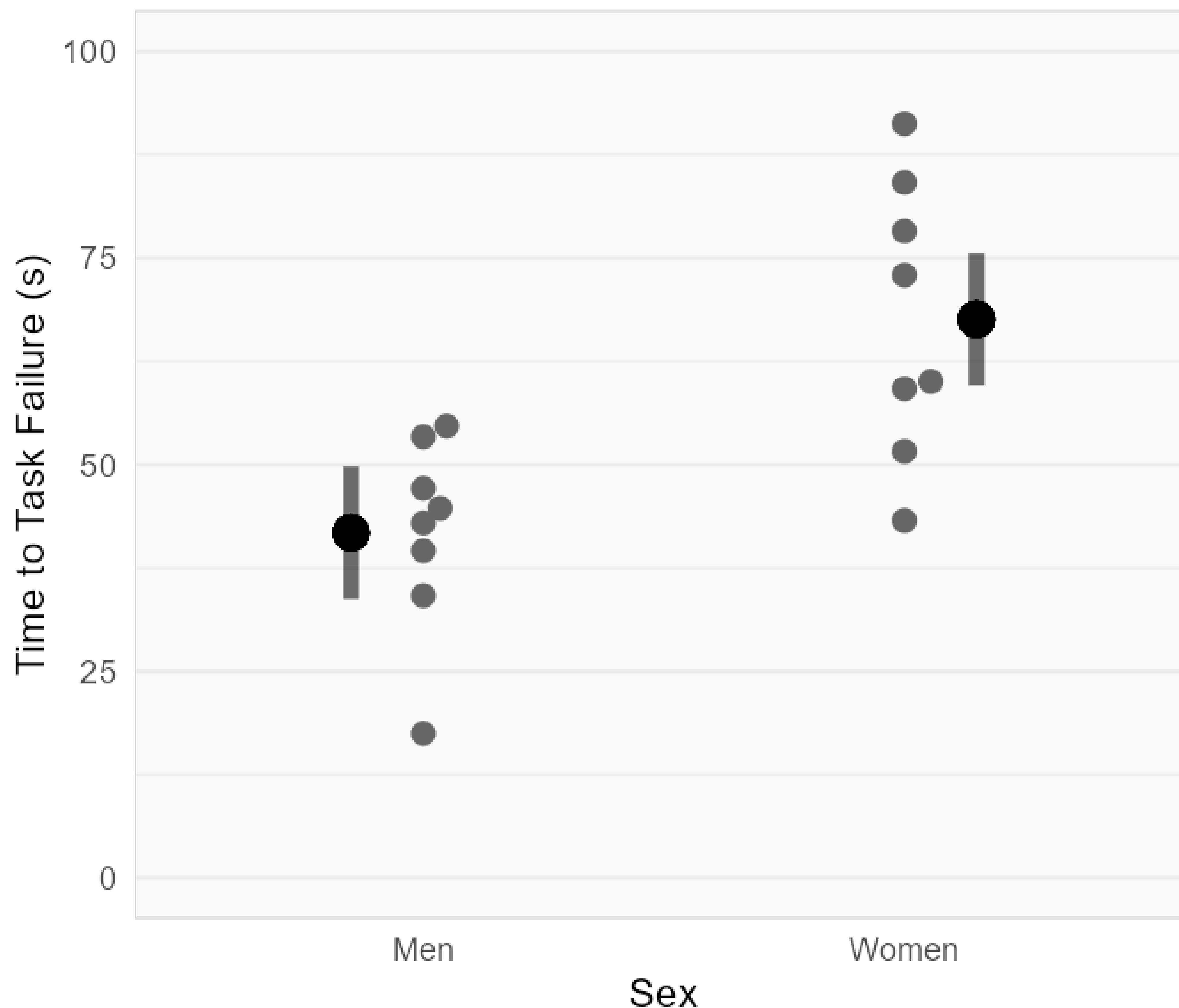


Figure 1. Time to task failure separated by sex and adjusted for condition. Black dots and error bars indicate the mean \pm SD. Grey dots indicate individual data points.

RESULTS

There was no sex x condition interaction ($p=0.844$; $\eta^2=0.003$) or main effect of condition ($p=0.519$; $\eta^2=0.003$, mean diff= 2.33 ± 7.56 s; $d=0.145$ [95%CI: -0.314, 0.604]). However, significant differences in TTF were observed between men and women (Figure 1; $p=0.003$; $\eta^2=0.421$). The significant main effect for sex indicated that the TTF was longer for the women (TTF= 67.60 ± 11 s) than the men (TTF= 41.76 ± 11 s) (mean diff= 25.84 ± 15.56 s; $d=1.602$ [95%CI: 0.439, 2.764]).

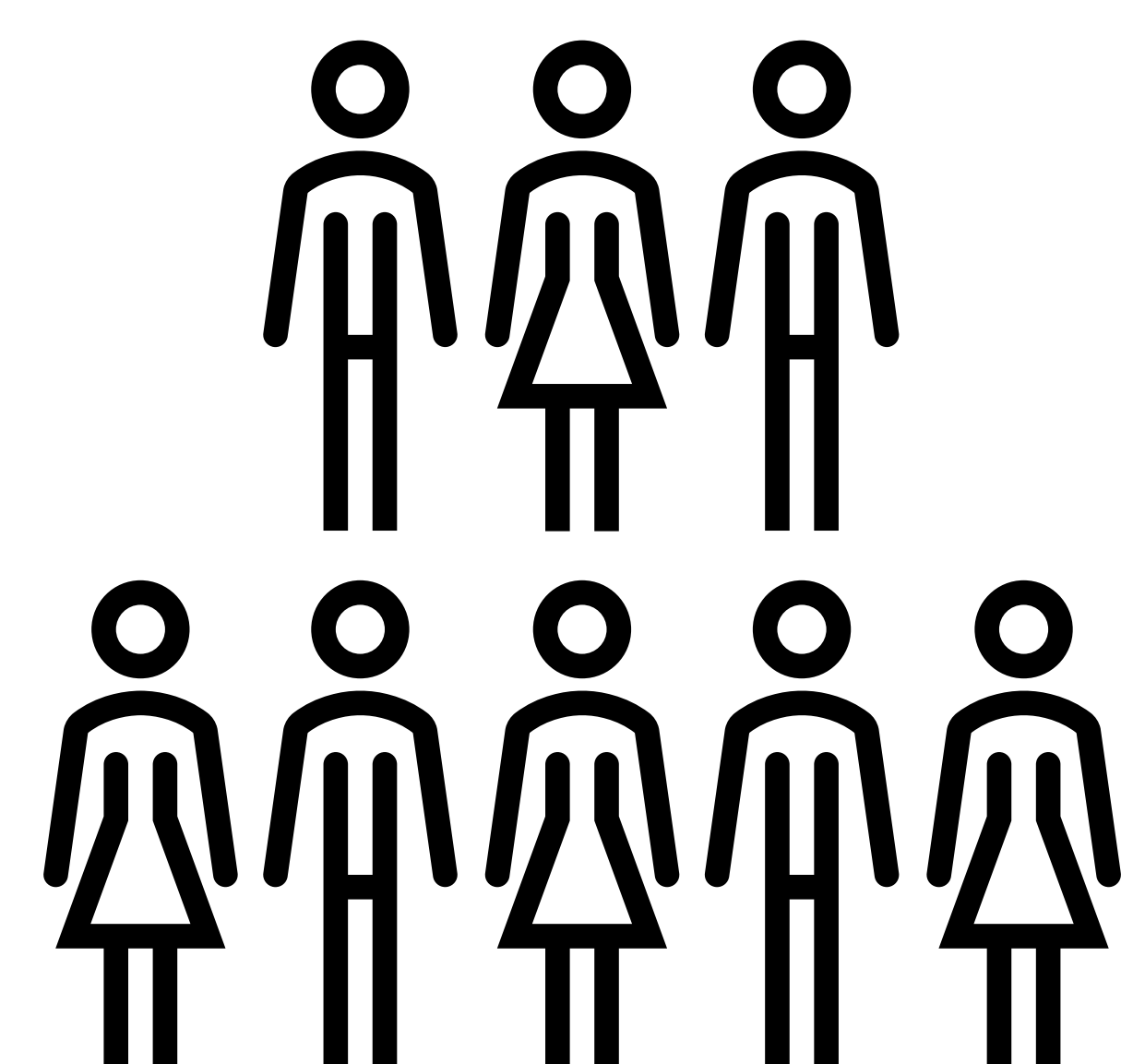
CONCLUSION

Similar to previous findings for fatiguing submaximal isometric exercise, these data indicated that women exhibited greater fatigue resistance compared to men; perhaps due to differences in the contractile properties of muscle (i.e., proportional area of slow-twitch fibers). Interestingly, unlike previous reports for submaximal exercise, TTF for maximal isometric exercise was not different between bilateral and unilateral conditions.

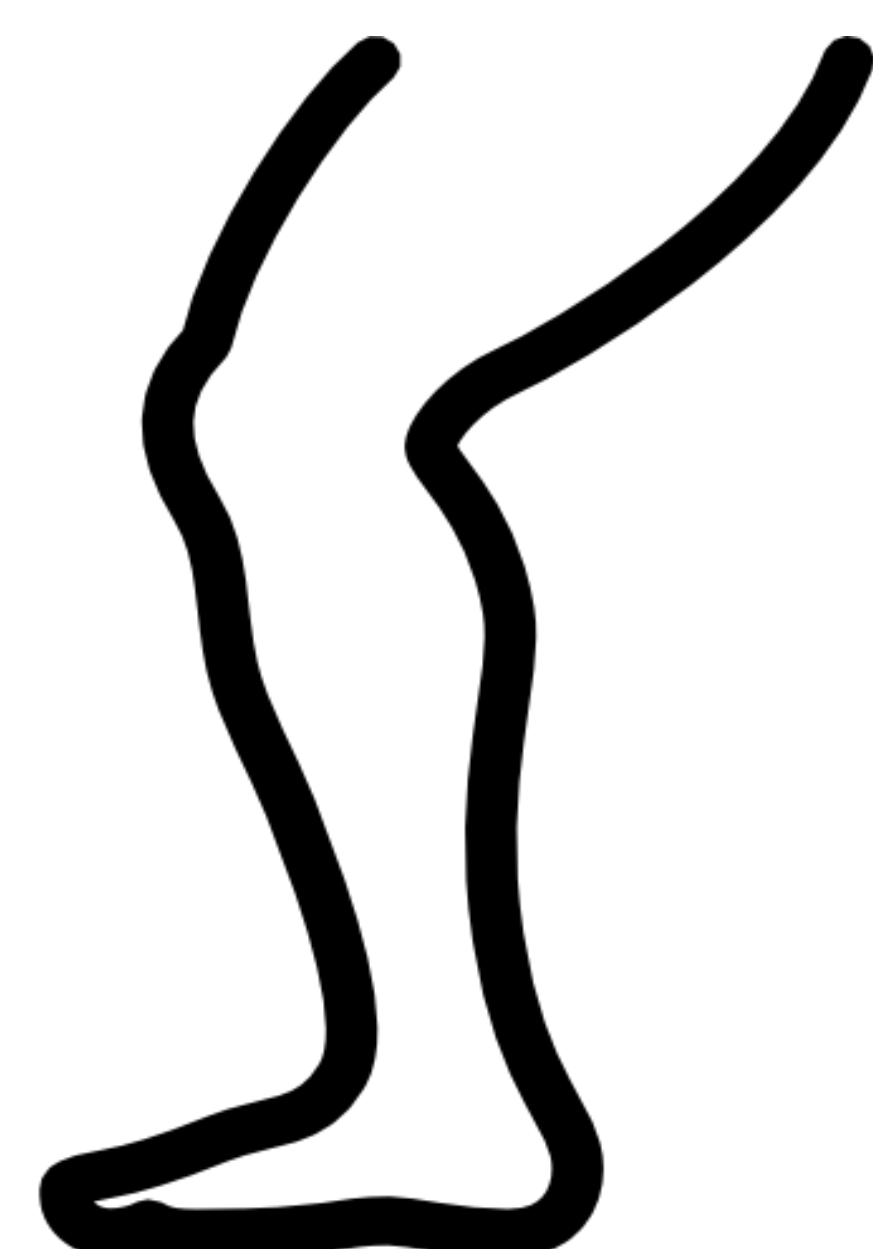
PRACTICAL APPLICATION

Sex may contribute to difference in TTF during fatiguing, maximal isometric exercise. Thus, practitioners should consider the potential influence of sex when designed any testing or training protocol involving isometric exercise.

METHODS



16 recreationally trained men ($n=8$) and women ($n=8$) between the ages of 18-35 were recruited for this study.



In a randomized order, participants performed, either bilateral or unilateral (dominant limb) pre-test MVICs of the leg extensors, followed by an MVIC hold to task failure under either bilateral or unilateral conditions. Task failure defined as a 50% reduction in force.



A sex (men vs women) x condition (bilateral vs unilateral) mixed analysis of variance (mixed-model ANOVA) was used to examine differences in TTF.