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# Sex does not influence CPK level kinetic after eccentric exercise?

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## Introduction

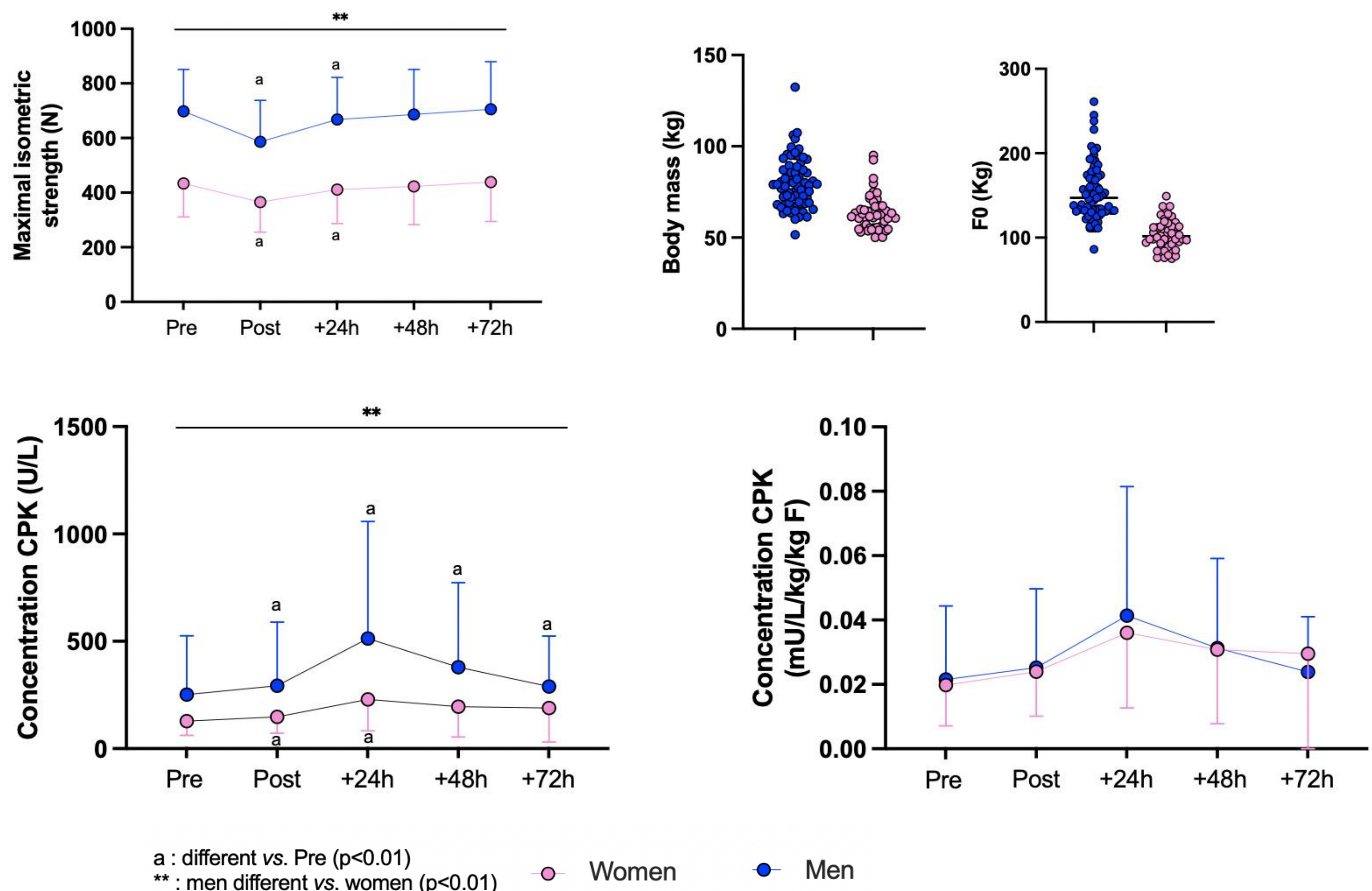
**Sports practice** in competition or training can create muscle damage. The damage reflects a stress imposed on the athlete in different ways, such as increased training workload, contacts, impacts, accelerations, decelerations, or eccentric exercise. The permeability of the cell membrane is increased, and proteins such as creatine phosphokinase (CPK), myoglobin, or lactate dehydrogenase are released in the blood. Muscle damage alters performance, at least transitory, and may lead to the injury. For these reasons, muscle damage monitoring can be performed to determine the biological recovery state of the athletes and to adapt the workload prescriptions. CPK is an easily quantifiable biological parameter that can be measured near to the field, which is very practical for sports staff. CPK values are influenced by sex, age, muscle mass, or athlete's physical level. For example, the median rest value is 72 U/L for women and 103 U/L for men (Brancaccio et al., 2007; Strømme et al., 2004). In humans, exercise-induced muscle damage often occurs after eccentric contractions, and conflicting results have been reported. While some studies suggest that there is no discernible difference between men and women, other studies support a higher susceptibility to exercise-induced muscle damage in men. This study aimed to investigate the sex responses to exercise-induced muscle damage and whether muscle mass and strength account for any difference between men and women.

## Methods

Seventy-one men (mean ± SD; age: 24.5±4.8 years; height: 180.5±7.1 cm; body mass: 79.9±13.7 kg) and forty-eight women (mean ± SD; age: 23.5±3.9 years; height: 165.1±6.0 m; body mass: 63.3±9.8 kg) were recruited. Each participant practiced at least 2 hours of physical activity per week. Individual maximal isometric strength (F0) was determined using a force-velocity profile on a leg press exercise. On a separate day, subjects performed 8 sets of ten 5-sec eccentric repetitions at 85% of their individual F0. Before and after exercise (+0h, +24h, +48h, and +72h), the maximal isometric strength, muscle soreness, and blood CPK levels of each participant were assessed.

## Results

Maximal isometric strength decreases significantly after exercise and 24-h after for both men and women. Muscle soreness was affected by the time but not by the sex. An effect of sex on absolute CPK levels was observed at all time points (p<0.01): men have higher CPK level values compared to women. However, the sex-difference was blunt when CPK levels were normalized to the maximal strength and body mass. When considering a pooled group, a significant time effect was found with a x1.22 increase of CPK levels after exercise, x1.84 at +24h, and x1.39 at +48h.



## Conclusions

Our results showed that the differences in muscle damage observed between men and women after an eccentric exercise on absolute CPK values were blunt when the data were normalized to both mass and maximal strength. Differences in CPK level seem explained by the higher muscle mass and muscle strength engaged by the men during the exercise and not by the sex. However, the sex appears to influence the recovery of the initial strength levels.

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