# Dehydration and Heavy Resistance Exercise Effect on Intracellular and Intramuscular Fluid Shifts

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## ABSTRACT

Dehydration may alter the ratio between the extracellular water (ECW) and intracellular water (ICW). Nevertheless, it is unknown whether the ratio between ECW and ICW following resistance exercise (RE) is affected by dehydration. **PURPOSE**: To determine the effect of dehydration on fluids shift after heavy RE. **METHODS**: 13 resistance-trained men (age: $21\pm2$years; height: $176.4\pm6.0$cm; weight: $79.5\pm11.5$kg) completed a heavy RE consisting of bilateral leg press and knee extension exercises (5 x 10 at 80% of 1 repetition maximum with 2-mins rest between sets & exercises) either under a hydrated (HS; urine specific gravity [USG] < 1.020) or a dehydrated state (DS; USG $\geq$ 1.020; 24-hour fluid restriction). The two conditions were separated by two weeks. The ratio of ICW/ECW and total body water (TBW) were measured before (PRE), 1 hour (1H), and 3H after RE using bioelectrical impedance spectroscope (BIS). Additionally, vastus lateralis muscle samples were collected at PRE, 1H, and 3H via muscle biopsy. Muscle samples were weighed (Wt) before (Wet) and after (Dry) heating at 80°C for 55 minutes. For BIS parameters, values were normalized to each participant's HS PRE value. For muscle Wt, percent changes from Dry to Wet were calculated. Repeated measures ANOVAs were used to identify the differences. **RESULTS**: A significant ($p < 0.05$) condition effect was observed for TBW, ECW, and ICW/ECW, while a main effect of time was observed for ICW, ECW, and ICW/ECW. For TBW, HS ($1.003\pm0.003$L) was greater than DS ($0.976\pm0.009$L). For ECW, HS ($0.984\pm0.004$L) was greater than DS ($0.947\pm0.010$L). For ICW/ECW, HS ($1.033\pm0.005$) was less than DS ($1.069\pm0.016$). For ICW, PRE ($0.985\pm0.004$L) was less than 1H ($1.055\pm0.007$L) and 3H ($1.002\pm0.006$L), while 1H was greater than PRE. For ECW, PRE ($0.980\pm0.005$L) was greater than 1H ($0.963\pm0.007$L) and 3H ($0.953\pm0.008$L), while 1H greater than 3H. For ICW/ECW, PRE ($1.005\pm0.004$) was lower than 1H ($1.097\pm0.025$) and 3H ($1.052\pm0.009$), while 1H was greater than PRE and 3H. Additionally, a significant condition x time effect was observed for Wt, where DS had a smaller percent decrease in Wt at 1H than 3H. **CONCLUSION**: Regardless of RE, DS resulted in lower TBW driven by the reduction in ECW. Regardless of hydration status, RE shifted fluid from the ECW to ICW at 1H post-RE. In addition, the intramuscular water content of the active muscle demonstrated less %change in water content at 1H post-RE. These results could suggest water was leaving from the muscle into the plasma 1hr post-RE but entering into the muscle after a 2-hour recovery.