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Time Course of Recovery Across Various Compound Resistance Exercises and the Relationship between Cell-Free DNA and Performance

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Abstract

In practice, the deadlift is perceived to require a longer recovery time than the squat or bench press. However, the time course of recovery has not yet between compared between these three exercises. Further, recent data have indicated an inverse relationship between cell-free DNA (cfDNA) and exercise performance, however, these relationships are preliminary.

PURPOSE

The purpose of this investigation was to examine the magnitude of muscle damage and subsequent recovery time between the squat, bench press, and deadlift.

METHODS

Twelve males (age: 24.5±3.8yrs, body mass: 84.01±15.44kg, height: 173.43±8.57cm, training age: 7.1±4.2yrs) performed 4 sets to failure at 80% of a one-repetition maximum (1RM) on the squat, bench press, and deadlift in successive weeks; in a counterbalanced order. Measures of indirect muscle damage and performance fatigue were assessed immediately prior to, post-exercise, and 24, 48, 72, and 96hrs post-exercise. Outcome measures were delayed onset muscle soreness (DOMS), average concentric velocity (ACV) at 70% of 1RM, creatine kinase (CK), lactate dehydrogenase (LDH), and cfDNA.

RESULTS

There were no between condition differences for changes in CK, LDH, or DOMS ($p>0.05$). However, ACV decreased in the squat condition for up to 72 hours ($p=0.02$, −8.61%) and in the bench press ($p<0.01$, −26.69%) immediately post-exercise, but did not decrease in the deadlift condition ($p>0.05$). There was a main time effect for increased cfDNA in the squat ($p<0.01$) and bench press ($p<0.05$), but not the deadlift ($p=0.153$). Further, there were various significant ($p<0.05$) and positive relationships between cfDNA and ACV during the recovery period. Specifically, immediately post-exercise changes in cfDNA were positively related changes in post-exercise ACV the squat ($r=0.64$, $p=0.02$). Further, immediately post-exercise changes in cfDNA were significantly related to deadlift ACV or approached a significant relationship with deadlift ACV at every recovery time point (immediate: $r=0.52$, $p=0.09$; 24hrs: $r=0.66$, $p=0.02$; 48hrs: $r=0.73$, $p=0.01$; 72hrs: $r=0.64$, $p=0.03$; 96hrs: $r=0.66$, $p=0.02$).

CONCLUSION

These results suggest that the deadlift does not require a longer recovery period than the squat or bench press following high volume training to failure in well-trained men. Further, changes in post-exercise cfDNA may predict velocity of resistance exercise performance throughout a 96-hour recovery period. Importantly, we observed direct relationships between cfDNA and performance, while a previous investigation has reported inverse relationships in this respect. Of note, our immediately post blood collection occurred ~10 minutes post-exercise, thus it is possible there was an increase in DNase activity, resulting in a decrease in serum cfDNA during the 10-minute window between the end of exercise and blood collection. Further, DNase kinetics have considerable individual variation and may account for some disparities.

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