

Effects of Muscular Fatigue on Endurance Athletes During a Backyard Ultra Race: A Pilot Study

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ABSTRACT

Neuromuscular fatigue is a complex phenomenon that occurs during long-duration exercise. A backyard ultra-race requires participants to intermittently run laps (<1hour) for distances that ultimately surpass ultramarathon mileage. Quantifying physiological fatigue during ultramarathon races is difficult due to duration, pace, and terrain; however, vertical jump via force plate analysis is an effective field-based method to quantify neuromuscular fatigue, and may be used to further predict individual race longevity. **PURPOSE:** The purpose of this study is to measure muscular fatigue utilizing force plate analysis during a back-yard ultra-marathon. **METHODS:** Twelve participants were recruited from sign-up participation in a local backyard ultramarathon race. Each participant performed maximal effort countermovement jumps on the force plate. Participants were instructed to place hands on hips and perform a maximal effort jump two times with two to three seconds rest between. Jumps were collected at baseline and immediately following completion of each 4.167-mile race loop. Participants completed the race course loops until volitional fatigue or until they could no longer maintain a loop in 60 minutes (failure). Participants who completed a total of four laps were included in the analysis for vertical jump height (VJ) and braking rate of force development (BRFD). A repeated-measures analysis of variance (ANOVA) was performed to determine differences in fatigue from baseline to each subsequent lap. Furthermore, data was separated by sex in order to identify any sex-related differences in fatigue. Alpha level was set at 0.05. **RESULTS:** Eight female (age= 27.6±14.15y; height=161±7cm; weight= 63.22±9.73kg) and four male (age=36.25±10.2y; height= 174.63±5.64cm; weight= 71.21±5.6kg) volunteer runners were included in this analysis. ANOVA (sex x time) revealed no statistically significant interactions for BRFD and VJ. There were no significant main effects observed in BRFD; however, there was a time main effect for VJ ($p<0.05$). Across the entire sample population, statistical significance was observed in VJ between the second and fourth time point ($p<0.05$). Though there were no interactions between sex, female VJ between the second and fourth timepoint reached statistical significance ($p<0.05$). **CONCLUSION:** VJ measured via force plate analysis may be a viable option to quantify rates of muscular fatigue during an ultramarathon race. Other extracted variables such as BRFD may not be reliable tools due to the lack of skill in participants. Although current literature provides evidence of sex related differences in fatigue rates, there were no significant findings for sex. Limitations include the sample size and possible variability in training status for some novice runners. Further exploration into the sport of ultra-running is warranted to determine if sex-related differences in fatigue within this population.