

# EFFECTS OF PROLONGED ACTIVITY ON VERTICAL JUMP PERFORMANCE

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## INTRODUCTION

Many research projects investigate the effects of peripheral fatigue on certain activities such as walking, jumping, and cutting (Viitasalo et. al.,1993, Nyland et. al.,1994). Typically subjects undergo a prolonged activity protocol to induce peripheral fatigue and then perform selected trials of a specified skill. It is not clear however, how long the effects of prolonged activity last. When subjects are peripherally fatigued prior to testing, the level of fatigue varies greatly among the testing trials as more time passes from the fatiguing bout. Several different fatigue protocols have been utilized, including the use of treadmills, isokinetic dynamometers, and intensive exercise bouts. For isokinetic protocols, typically a decrease in torque production is measured. Once the subject is fatigued (as defined by the investigators) the subjects have to get out of the apparatus, move to the testing area, and wait for the investigators to prepare for testing before testing actually begins. By this time significant recovery may have occurred, and it is unknown as to how much the subject has recovered. As each trial goes by, more time passes, and more recovery takes place. Few have studied recovery rates of lower extremity peripheral muscle fatigue (Robinson et.al.,1990, Milner-Brown et.al.,1986). The purpose of this investigation was to determine how long the effects of peripheral fatigue last using a lower extremity peripheral fatigue protocol to enable investigators to more efficiently design experiments.

## METHODS

Six male and 3 female healthy, volunteers were tested. The subjects were 26.9 ( $\pm 5.3$ ) years of age, 172.5 ( $\pm 8.6$ ) cm tall, and weighed 754.5 ( $\pm 180.2$ ) N. Subjects did not have any injuries within the past three years. Informed consent was obtained from each participant.

Each subject warmed up by walking on a treadmill for 5-10 minutes followed by light stretching. Reach height was measured. All height measurements were made to the nearest inch using a home made device for measuring jump height. The subjects performed five maximal vertical jumps, the highest jump defined the maximum jump height (MJH). Each subject performed six trials consisting of the following procedures: Subjects maximally jumped at a rate of 1 jump every 2 seconds until 3 consecutive jumps fell below 50% of the MJH (fatigue level)(prolonged activity protocol). They were then randomly assigned a resting period. After resting, the subjects performed 3 more maximum jumps; the heights were recorded (recovery height). The subjects then rested for two-minutes before starting the prolonged activity protocol again. This protocol was be done for resting periods of 15, 30, and 45 seconds, 1, 2, and 3 minutes for a total of 6 trials. The assignment of resting periods was randomized.

Vertical jump height was determined by subtracting reach height from MJH. The three recovery jump heights recorded after

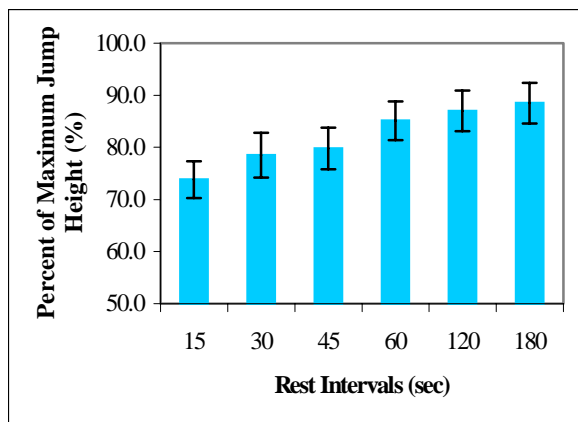
each rest interval were averaged. All average recovery jump heights were normalized (NRJH) to the MJHs.

$$\text{NRJH} = 100 + [(\text{avg. recovery ht.} - \text{MJH}) / \text{vertical jump ht.} * 100].$$

Repeated measures ANOVA were run to test significance between NRJH and the MJH, NRJH and 50% MJH, and NRJH and 75% MJH ( $p < 0.05$ ). SPSS was used for statistical analysis.

## RESULTS

Figure 1 shows the recovery jump height as a percentage of MJH. As the rest interval increases, the recovery jump height becomes closer to the MJH. All recovery jump heights were significantly less than MJH. All recovery jump heights were also significantly greater than 50% of the MJH. When compared to 75% of MJH, the 15, 30, and 45-second rest intervals were not significantly different. These results show that between 15 and 45 seconds subjects have already begun to recover from the fatigue level and are at approximately 75% of MJH. Between one and three minutes, subjects are not fully recovered, however, their levels of performance were greater than 75% of their MJH.



**Figure 1:** Recovery jump heights as a percentage of maximum jump height.

## DISCUSSION

This study investigated how effective a peripheral fatiguing protocol would be in causing a prolonged decrement in performance. This investigation can assist investigators in planning protocols incorporating local fatigue conditions. It appears, based on these data, that subjects must be “re-fatigued” between trials, and investigators must keep the time between reaching “fatigue” and data collection to a minimum, under 15 seconds, if possible.

## REFERENCES

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