INTRODUCTION
Lower limb muscle fatigue has been shown to cause motor adjustments during walking and obstacle crossing [1]. Walking and simultaneously performing an attention demanding task could take place with the presence of physical fatigue, especially at the end of a working day. Tripping over an obstacle during walking is one of the most frequently mentioned causes of falls [2]. Although previous studies have demonstrated how a concurrent cognitive task or muscle fatigue affects walking performance [3], the effect of muscle fatigue on distracted obstacle-crossing remains unclear. The purpose of this study was to examine changes in crossing behavior and in concurrent working memory task performance of healthy young adults after lower extremity muscles are fatigued.

METHODS
Twenty-four healthy adults (11 females, 21.1±2.3 yrs) performed the following three tasks before and after a muscle fatigue protocol with a random order: 1) walking and crossing over an obstacle with height set at 10% of body height (OC), 2) sitting and performing a 3-back test, in which participants listened a series of digits over a loud speaker and were instructed to verbally respond "yes" whenever digit matched the one from three steps earlier in the sequence (Nback), 3) Obstacle-crossing and performing a 3-back test simultaneously (OC+Nback).

A 30-minutes sit-to-stand task at a pace of 0.5 Hz was performed to induce the muscle fatigue. The maximal voluntary isometric strength of knee extensors was assessed using a dynamometer before an, immediately after the fatigue protocol and at the completion of the entire study. Whole body motion data were collected from a set of 29 retro-reflective markers with a 10-camera motion system. The whole-body center of mass (CoM) was calculated as the weighted sum of 13 body segments. Gait speeds were calculated as the average forward CoM velocity during a gait cycle. Dependent variables for crossing characteristics included the toe-obstacle vertical clearance (TC) and foot horizontal placements (FP) of trailing and leading feet.

Two-way ANOVA with repeated measures was used to examine effects of fatigue (pre- and post-fatigue) and gait condition (single- and dual-tasks). Alpha level was set at .05.

RESULTS AND DISCUSSION
An average of 22.8% knee extensor strength reduction was observed immediately after the completion of fatigue protocol, and it was recovered to approximately 14.2% by the completion of study protocol. The average time-to-fatigue during the sit-to-stand task was 24.9 minutes.

Gait speeds showed significant main effects of fatigue (Table 1) and gait condition (Table 2). Participants crossed over the obstacle significantly faster after they were fatigued and slower when responding concurrent 3-back task. Accuracy of 3-back test showed a significant interaction effect (Figure 1). Three-back test was significantly less accurate in the dual-task than in the single-task condition. It is worth noting that the accuracy was significantly improved in the single-task condition from pre-fatigue to post-fatigue.

CONCLUSION
Lower leg muscle fatigue improved working memory performance in the single-task condition and affected the leading foot placement during obstacle-crossing.

REFERENCES