INTRODUCTION
Although visual feedback is regularly prohibited in joint position sense research [2], it has not been established how vision impacts joint position sense accuracy. The purpose of this research was to examine the effect of added visual feedback on absolute error during a shoulder joint repositioning task. It was hypothesized that the addition of visual feedback would result in lower absolute error when compared to a control condition of no visual feedback.

METHODS
Data were collected from eighteen subjects using an iTouch application developed for assessing shoulder joint position sense. The following protocol was adapted from the study validating the application [1]. An iTouch in a sport band was attached to the upper arm of a subject seated in a black cubicle.

In the guided stage of a trial, the application guided the subject from a resting position to a target angle by providing auditory feedback (a high tone indicated that the subject’s arm was too high, a low tone signaled that the arm was positioned too low). Upon reaching the target angle, the subject held and memorized the position until prompted by the application to “relax” and return to the resting position. In the replication stage of the trial, the subject again began in the resting position and was prompted to “find target” and replicate the memorized angle without auditory feedback.

Each subject participated in two blocks of twelve trials testing three target angles (50°, 70°, 90°) that were each presented four times. During one block, the subject was allowed visual feedback and was instructed to keep their eyes open throughout each trial. During the other block, the subject was denied visual feedback and instructed to close their eyes throughout each trial.

RESULTS AND DISCUSSION
A two-way 3x2 factorial analysis of variance was conducted to assess the influence of visual condition and target angle on absolute error.

A significant main effect of visual condition on absolute error was found with greater error when no visual feedback is available than when visual feedback is added (P<0.001). The added visual feedback only reduced absolute error by about one degree compared to no visual feedback.

Additionally, a significant main effect of angle on absolute error was found (p<0.01). A significant difference was found between angle and accuracy at 50° and 90°, with greater error at 50° (P<0.01).

CONCLUSIONS
The results support the hypothesis that the addition of visual feedback throughout a shoulder joint repositioning task would result in lower absolute error when compared to the same task without visual feedback. The reduction in error with added visual feedback is about one degree. The results are consistent with previous research in demonstrating trend of decreasing absolute error as the angle approaches 90°.

REFERENCES