INTRODUCTION: Estimation of skeletal muscle fiber composition has long been performed through fatigability tests. These non-invasive methods have great application as they are easy to administer and provide quick estimations of percent fast-twitch fiber type (%FT). The classic Thorstensson fatigue test estimation equation is based on the application of a direct fiber typing technique (ATPase histochemistry) which only allowed measurement of Type I and Type II fiber types. However, more recent analysis techniques have identified that human skeletal muscle contains numerous fiber types on a continuum from slow (Type I) to fast (Type IIa), including fibers that contain both slow and fast-twitch properties ("hybrids"). Using these updated typing methods and increasing repetition number may improve the validity of a fatigability test designed to estimate %FT.

PURPOSE: To compare the validity of muscle composition estimation using a fatigue test.

METHODS: Thirteen resistance trained men (age=25.0±1.5 y; height=179.0±5.6cm; mass=82.6±9.1kg) volunteered. They sat on a Biodex isokinetic dynamometer and performed 60 maximal knee extensions at 180 degrees per second, measuring fatigue percentage (FP). They returned on a separate day for a muscle biopsy of their vastus lateralis from the same leg and performed 60 maximal knee extensions at 180 degrees per second, measuring fatigue percentage (FP). They returned on a separate day for a muscle biopsy of their vastus lateralis from the same leg. Approximately 200 individual fibers (per participant) were isolated and analyzed using SDS-PAGE for the identification of myosin heavy chain (MHC) molecular weight. Six fiber types, MHC I, I/IIa, I/IIa/IIx, IIa, IIa/IIx, and I/IIa/IIx were identified. Regression analysis used FP [(avg of first 3 reps-avg of last 3 reps/avg of first 3 reps) * 100] of either the initial 3 reps, inclusive of peak torque, and reps 58-60 (P60) or the classic Thorstensson test, which uses the first 3 reps and reps 58-60 (P60). These were compared to the number of MHC IIa fibers (MHCIIa) (Table 1).

RESULTS: Neither CT or P60 were valid in estimating MHCIIa (%FT). These were compared to the number of MHC IIa fibers (MHCIIa). Fatigue percentages from both the CT and P60 were not able to accurately estimate the percentage of pure fast-twitch muscle fibers. Further combinations of repetition ranges should be investigated in order to find a more accurate estimation of fast-twitch muscle composition. Another option would be to include hybrid fibers, such as MHC I/IIa, in the analysis.

CONCLUSIONS: Fatigue percentages from both the CT and P60 were not able to accurately estimate the percentage of pure fast-twitch muscle fibers. Further combinations of repetition ranges should be investigated in order to find a more accurate estimation of fast-twitch muscle composition. Another option would be to include hybrid fibers, such as MHC I/IIa, in the analysis.