REEXAMINING SKELETAL MUSCLE FATIGABILITY AND FIBER TYPE IN RESISTANCE TRAINED MEN: 40 YEARS AFTER THORSTENSSON AND KARLSSON

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Nearly 40 years ago Thorstensson and Karlsson developed an equation (THOR) allowing a fatigue test to estimate the percentage of fast-twitch muscle fibers (%FT) in an individual’s vastus lateralis (VL). Fiber-typing methodologies have advanced considerably since this time. Moreover, THOR was developed from a heterogeneous group of habitually active men. PURPOSE: Reexamine THOR using modern muscle fiber-typing techniques and in resistance-trained men. METHODS: Fifteen resistance-trained males (strength/power-trained ≥3d/wk for ≥6months; age=24.8±1.3y, height=1.79±0.05m, mass=82.2±8.0kg) performed 60 maximal knee extensions at 180°/s on an isokinetic dynamometer, returning on a separate day for a VL muscle biopsy. Approximately 200 individual fibers (per participant) were isolated and analyzed for fiber type using sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE). Individual muscle fibers were identified as either expressing myosin heavy chain (MHC) I, I/IIa, IIa, IIa/IIx, IIx, or I/IIa/IIx. %FT was determined as a combination of MHC IIa, IIa/IIx, and IIx. RESULTS: The original correlation between FT% and percent decline in peak torque (r=0.86, p<0.01) was not reproduced here (r=0.11, p>0.05). Moreover, a Bland-Altman plot suggested THOR overestimated %FT by an average of 6.91%, with a range of -27.62% to +41.44% (limits of agreement, 95% Confidence Interval) in our participants. CONCLUSIONS: This collectively suggests fiber phenotype alone does not predict performance during a fatigue test in strength-trained men. These findings likely differ from Thorstensson and Karlsson because we utilized the highly precise single fiber-typing method that allowed differentiation of fibers into 6 isoform categories (as opposed to only 2 in THOR). However, THOR may still be valid when examining across heterogeneous exercise backgrounds or “habitually active” participants.