



MRI gluteal/thigh muscle fat fraction detects NSAD motor task failures in men with Becker muscular dystrophy

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Background

- Becker Muscular Dystrophy (BMD) leads to the replacement of skeletal muscle by fat and impaired functional performance.¹⁻²
- Quantitative magnetic resonance (qMR) imaging measurements of muscle fat fraction (FF) have been used as a biomarker of muscle deterioration.²⁻⁹
- qMR whole-body imaging (WBI) allows for the rapid assessment of multiple muscles and develop FF composites.

Aims:

- 1) Assess the relationship between qMR FF and functional performance, as measured by the North Star Assessment for Dysferlinopathies (NSAD)
- 2) Determine qMR FF cut-off values for loss of performance on NSAD tasks that require gluteal and thigh muscle contractions.

Methods

- Data collected as part of ImagingNMD (NCT01484678) at:
 - University of Florida and
 - Oregon Health and Science University
- 43 men with BMD aged 18 to 62 years
 - Median age: 33.0 years
 - 14% nonambulatory

A. GlutThigh Fat Fraction (FF): average fat fraction of the right gluteus maximus, gluteus medius/minimus, quadriceps femoris, and hamstrings (*Figure 1*)

- 3-point Dixon chemical-shift encoded water-fat images

B. North Star Assessment for Dysferlinopathies (NSAD)¹⁰

- 29-item assessment of motor performance (*Figure 2*)

C. Statistical Analysis:

- Relationships were assessed using the Spearman's rho (r_s).
- GlutThigh cut-off values (men able or unable to perform each NSAD task) were calculated using the receiver operating characteristic (ROC) and the Youden Index.

qMR water-fat images in two men with BMD.

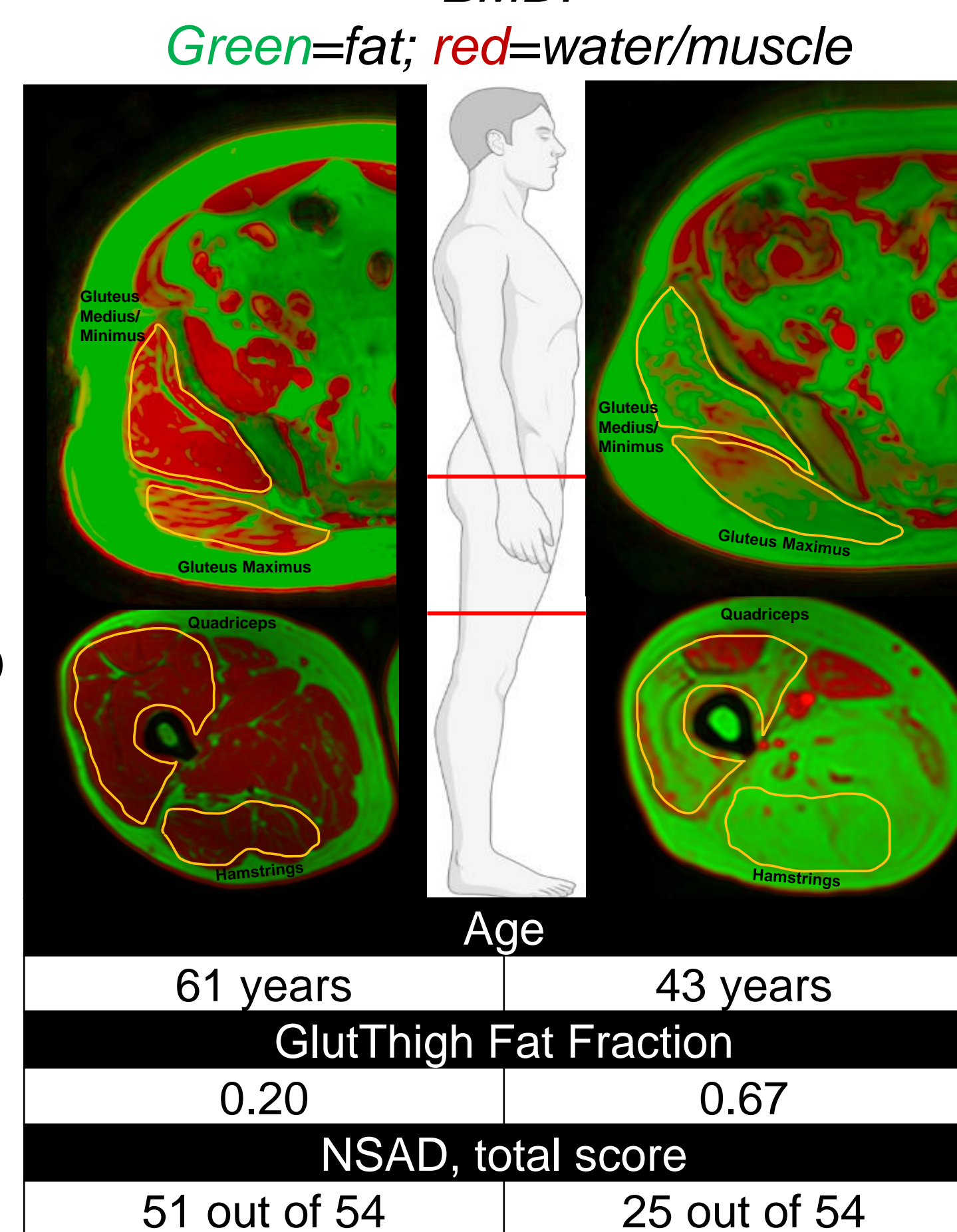
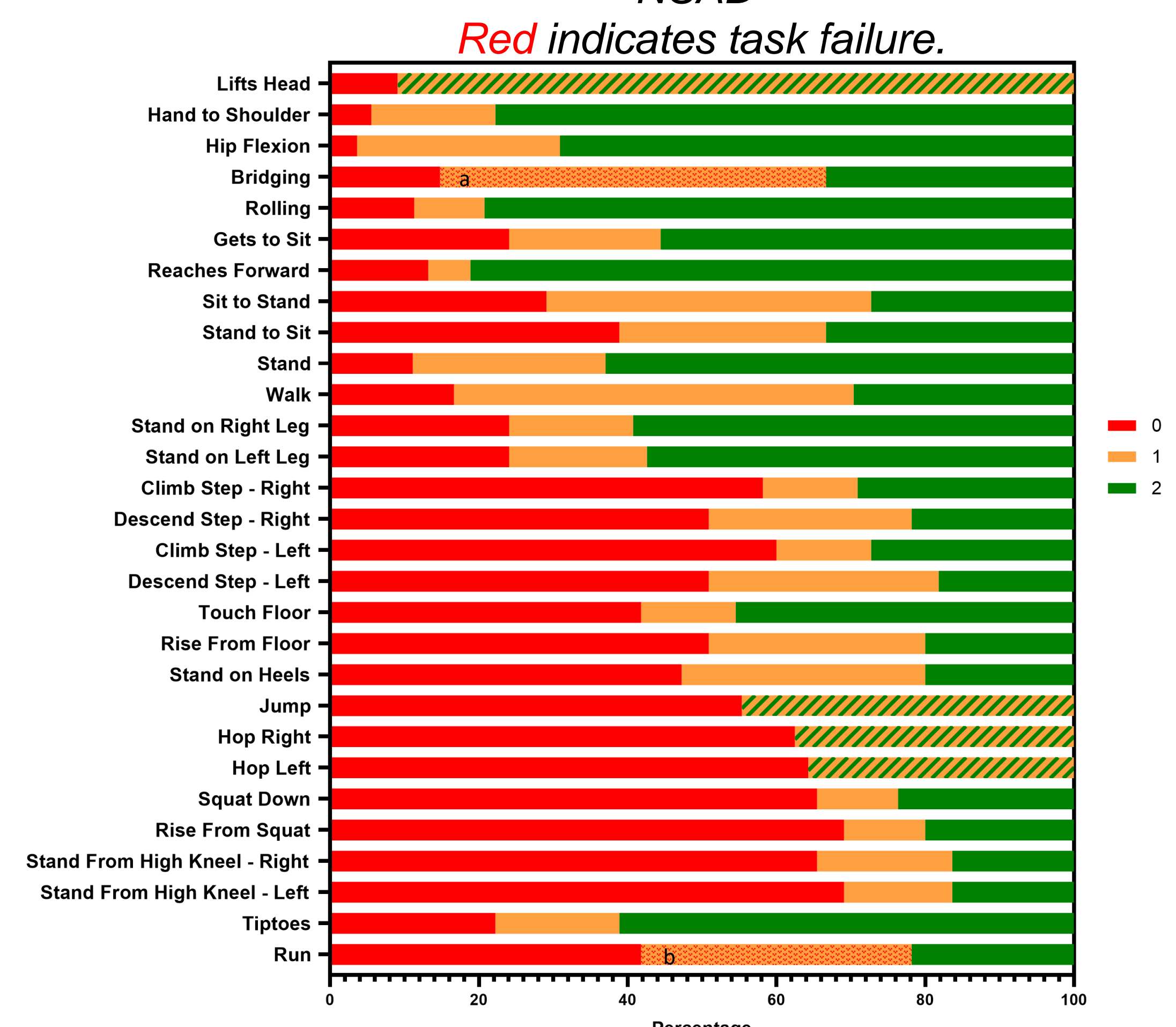


Figure 2. Percentage of participant scores on NSAD



Results

Figure 3. GlutThigh cut-off values for functionally-relevant tasks

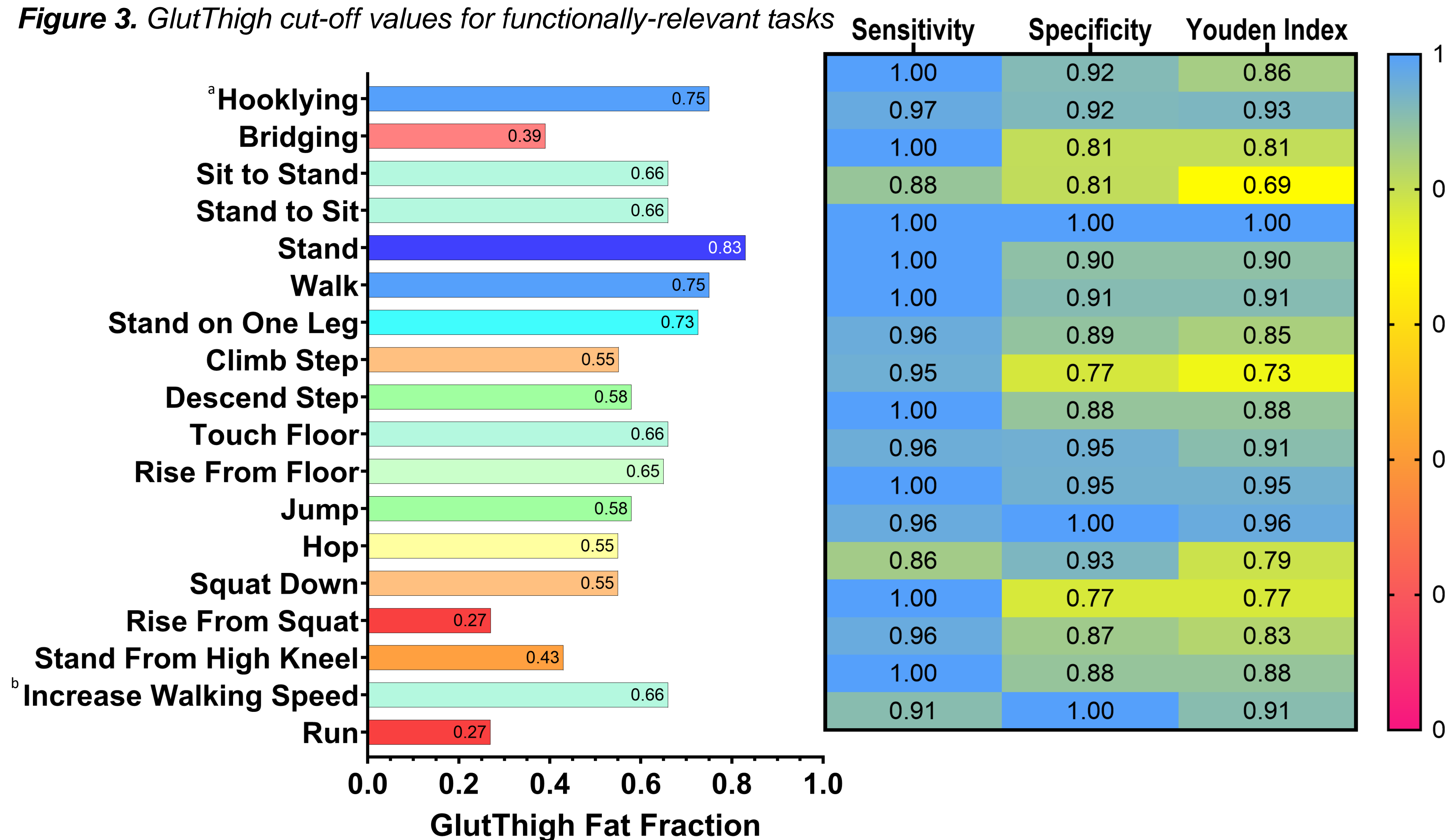
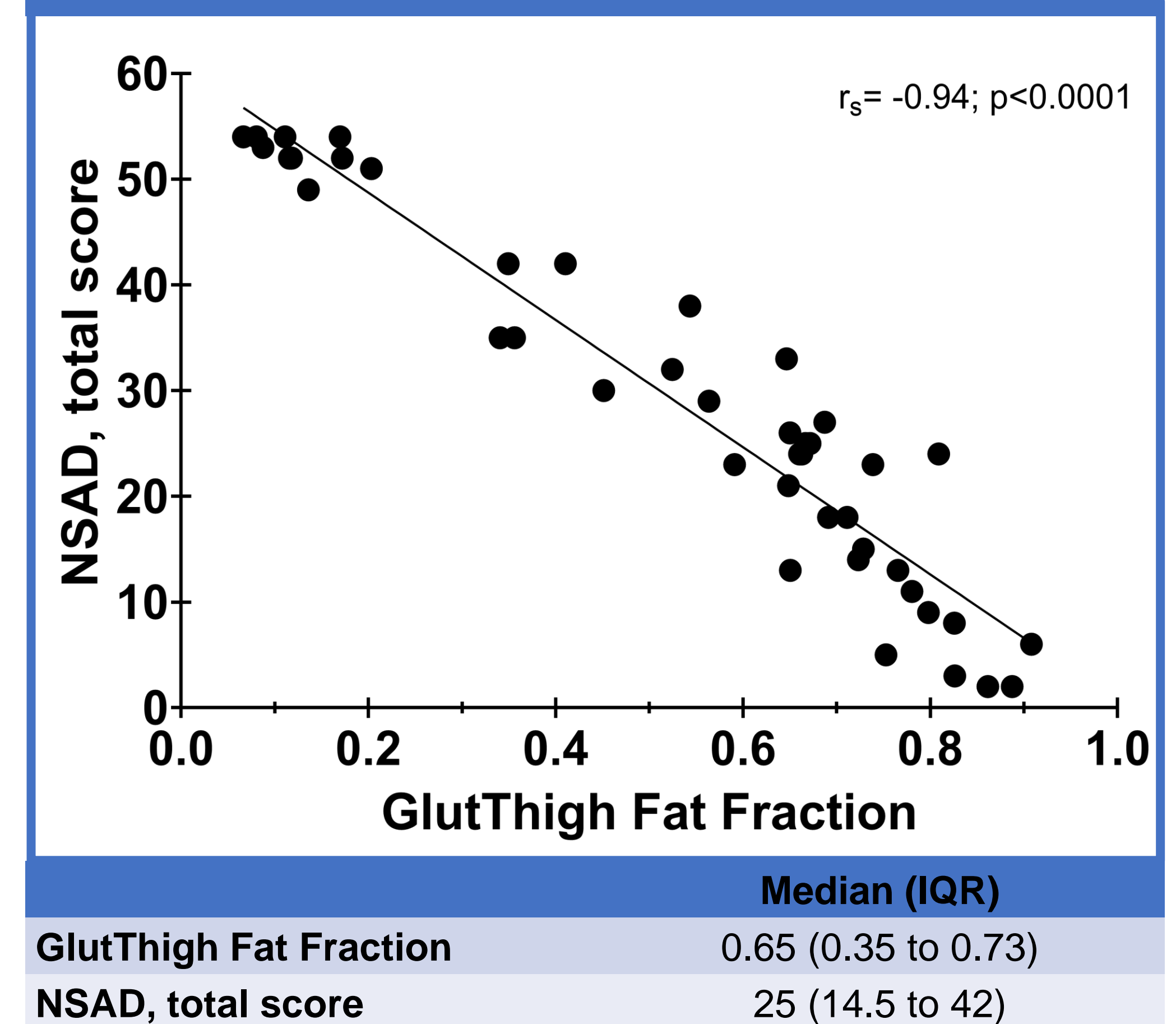


Figure 4. Higher GlutThigh fat fraction is strongly associated with lower NSAD scores



Conclusions

- Higher GlutThigh FF values are strongly associated with poorer NSAD performance
 - more challenging NSAD tasks have lower GlutThigh cut-offs.
- GlutThigh FF cut-off values have high sensitivity and specificity to detect NSAD task failures across a wide range of men with BMD.
- qMR WBI GlutThigh FF provides important insight into functional performance in men with BMD and may serve as a functionally-relevant biomarker of disease status in future clinical trials.

Acknowledgements

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References:

- 1) Burakiewicz et al., 2017; 2-3) Comi et al. 2022; 2023; 4-5) Forbes et al., 2016; 2020; 6-7) Willcocks et al., 2016, 2024; 8-9) Barnard et al., 2018, 2020; 10) James et al., 2022

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