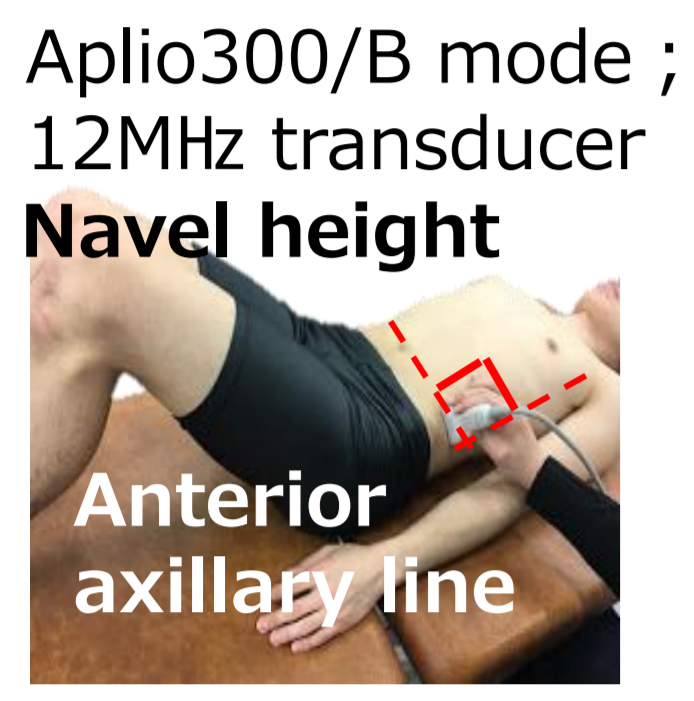


01 Introduction

The transverse abdominis muscle (TrA) is one of the dynamic stabilize system of the trunk, and it shows to increase the thickness of TrA from supine to single leg stance without regarding trunk movements (Yokomori M, et al. 2019). Several researchers reported the function of the TrA can be assessed using drawing-in maneuver (DI) with ultrasonography (US) (Kiesel KB, et al. 2007, Koppenhaver SL, et al. 2009), however, it is unclear that these assessment reflects to both the performance and TrA activity during lower limb reach task with single leg standing. The aim of this study is to investigate for the validation of the assessment of the TrA using DI with US.

02 Subjects

48 healthy-male subjects



Drawing-in (DI)

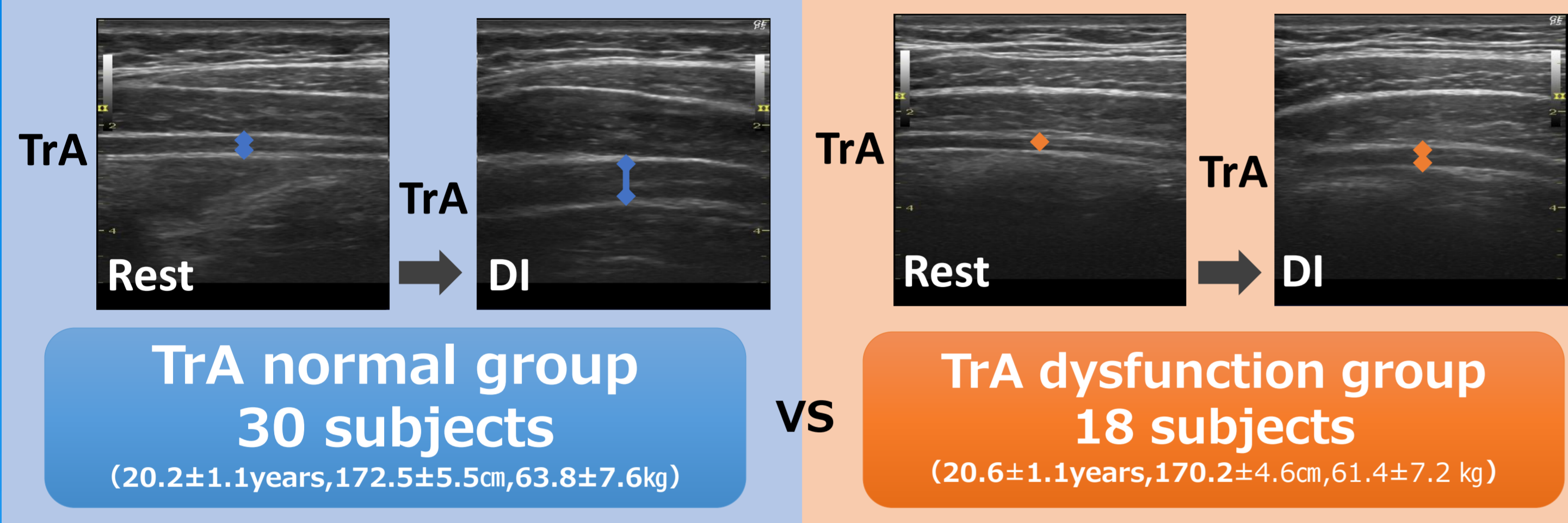
Exclusion
 The Manual Muscle Testing of trunk and hip joint abductor muscle was assumed to be less than 4

$$\text{Muscle thickness change ratio (\%)} = \frac{(DI - \text{Rest})}{\text{Rest}} \times 100$$

(Kiesel, et al. 2007)

Over 100%

Less than 100%



03 Methods

Y-Balance Test (YBT)



Measurement was performed during YBT

① Muscle thickness change ratio (%)

$$= \frac{(\text{maximum muscle thickness during YBT} - \text{muscle thickness at supine position})}{\text{muscle thickness at supine position}} \times 100$$

- US: Aplio 300, B mode, 7 MHz micro curvilinear transducer
- Used the custom made ultrasound transducer holder

② Trunk motion (°)

$$= \frac{(\text{maximum movement during YBT} - \text{start standing position})}{\text{start standing position}}$$

- A 3-dimensional motion analysis device: VICON MX
- Trunk movement: movement of the thorax with respect to the pelvic
- Measurement of flexion / extension, side bending, rotation

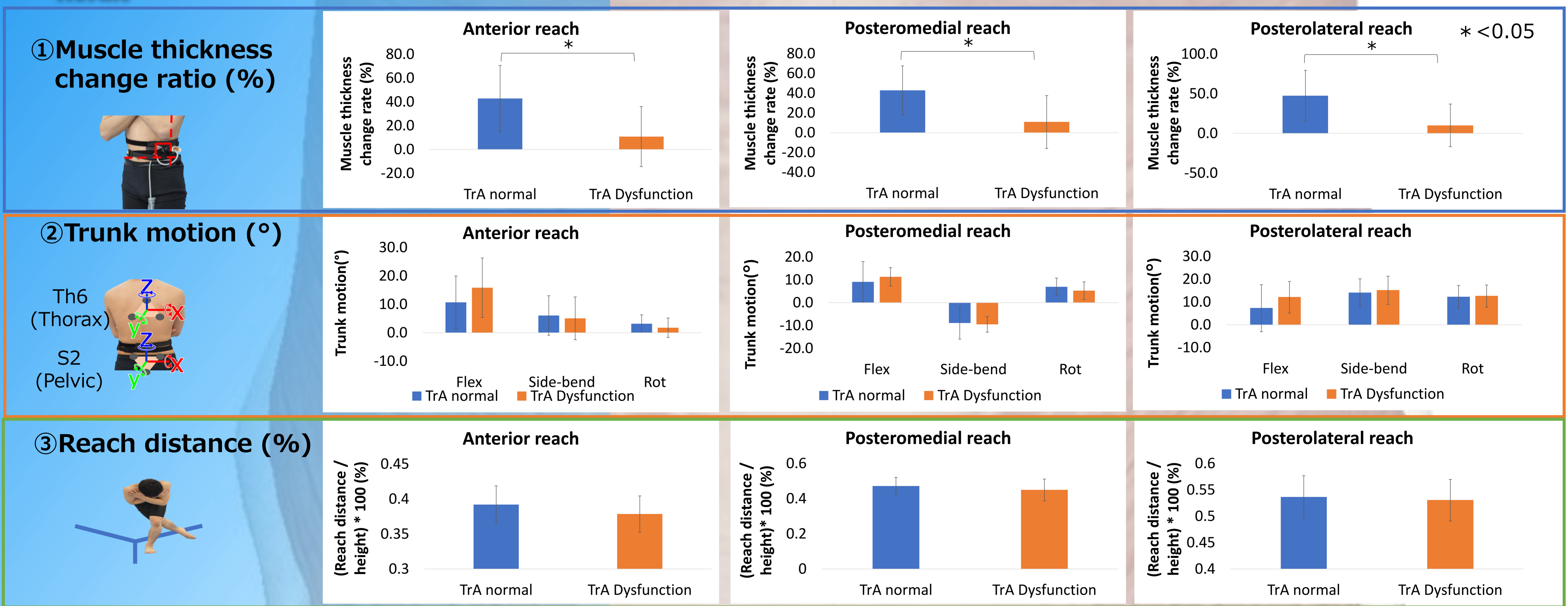
③ Reach distance (%)

$$= \frac{(\text{Reach distance} / \text{height}) \times 100}{\text{height}}$$

- Reach distance was measured using tape measure
- Measurement of Anterior, Posteromedial, Posterolateral reach

- The median of the reach of three times in each direction was used as a representative for analysis (①, ②, ③).
- ①, ②, and ③ were compared between the TrA normal group and the TrA dysfunction group.
- The independent samples t-test and the non-parametric Mann-Whitney test.
- Significance was set at p < 0.05.
- Statistical analysis was performed using SPSS (version 25).

04 Result



- The muscle thickness change rate was significantly lower in all three directions in the TrA dysfunction group (p < 0.05).
- Each trunk movement were no significant differences between the two groups.
- Each reach distance were no significant differences between the two groups.

05 Discussion & Conclusion

- Muscle thickness of TrA in YBT increased more than supine position.
- However, muscle thickness change ratio was significantly lower in TrA dysfunction group, and it became clear that DI reflects muscle activity during YBT.
- On the other hand, TrA muscle function did not affect the trunk motion and the reach distance.
- TrA functions as dynamic stability of the spine and is anatomically poor for causing spine motion (Urquhart DM, et al. 2005).
- In addition, it is reported that the reach distance is affected by the function of the lower limbs (Jatin P, et al. 2014, Gordon A, et al 2013, Rasool J, et ai. 2007).
- Therefore we could not be assessed the function of the TrA using trunk motion observation and performance test.
- It was clarified that DI reflected the TrA activity during YBT.
- DI can be estimated function of the TrA during YBT.
- We find that the dysfunction of the TrA assessed using DI decrease thickness of TrA during the YBT.**
- Both trunk motion and reach distance during YBT cannot predict the function of TrA.**