6-1-2021

Trunk and Lower Extremity Muscle Activity During the Y Balance Test in Healthy Adults

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INTRODUCTION

Y balance test kit™ (YBT) is commonly used for the clinical assessment of dynamic balance. YBT is an instrumented version of the Star Excursion Balance test (SEBT) that has Anterior, Posteromedial, and Posterolateral directions of the SEBT. SEBT has also been used as a training tool to improve dynamic balance and neuromuscular balance. Strength gains are expected from the exercises that cause EMG activation levels greater than 40%, however activation levels below 40% are still beneficial in improving NM control.

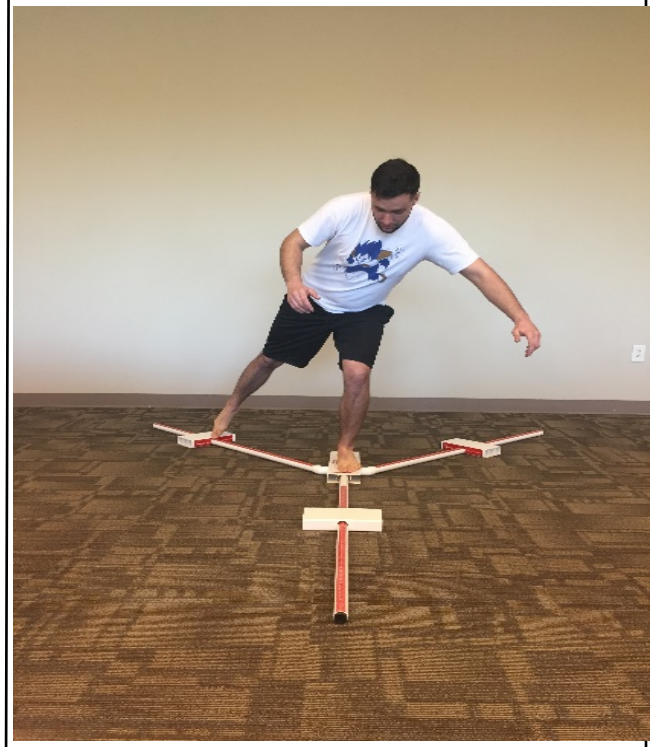
PURPOSE: To determine electromyographic (EMG) activity of the trunk and lower extremity muscles during YBT performance.

METHODS

Surface EMG was collected on 10 males and 10 females healthy adults for the Erector Spinae, External Oblique, and Rectus Abdominis for both ipsilateral and contralateral sides of the stance leg, and Gluteus Medius, Gluteus Maximus, Rectus Femoris, Vastus Lateralis, Vastus Medialis, Medial Hamstrings, Biceps Femoris, Anterior Tibialis, and Medial Gastrocnemius muscles of the stance leg during the performance of the YBT.

STATISTICAL ANALYSIS

A 2-way repeated measures analysis of variance (ANOVA) was used to determine the interaction between percentage maximal voluntary isometric contraction and reach directions of the YBT. Separate one-way repeated measures ANOVA for each muscle was performed to compare the normalized EMG values of the same muscle across the three reach directions. Pairwise comparisons were performed using the Sidak post hoc test at an alpha level of 0.05.



Participant demonstrating Y Balance Test in the posteromedial direction

RESULTS

Directions with highest EMG activity of each muscle represented by %MVIC (maximal voluntary isometric contraction)

Anterior		Posteromedial		Posterolateral	
Muscles	Mean+ SD	Muscles	Mean+ SD	Muscles	Mean+ SD
iRA	13.1% ± 11.0	cEOB	36.8% ± 44.7	iES	63.2% ± 27.5
cRA	9.0% ± 6.1	cES	36.1% ± 14.1	GMAX*	12.9% ± 7.6
iEOB	18.6% ± 15.1	GMED	36.5% ± 19.2	BF	23.6% ± 12.9
VL	88.5% ± 38.6	RF	42.4% ± 32.8	AT	52.1% ± 17.0
VM	97.1% ± 57.8			MG	47.9% ± 27.8
MH	30.8% ± 17.5				

i: ipsilateral, c: contralateral, RA: Rectus Abdominis, EOB: External Oblique, ES: Erector Spinae, GMED: Gluteus Medius, GMAX: Gluteus Maximus, RF: Rectus Femoris, VL: Vastus Lateralis, VM: Vastus Medialis, MH: Medial Hamstrings, BF: Biceps Femoris, AT: Anterior Tibialis, MG: Medial Gastrocnemius, SD: Standard Deviation. *Statistically not significant.

DISCUSSION and CONCLUSION

Trunk and LE muscle activation are direction dependent during the YBT. The study could provide guidance to the clinicians regarding the selection of the appropriate reach directions during trunk and LE rehabilitation when using YBT as a training tool to improve strength or neuromuscular control.

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