

VALIDITY OF Y-BALANCE TEST CRITERIA USED FOR RETURN-TO-PLAY DECISION-MAKING IN PEDIATRIC ATHLETES AGED 8 TO 10 YEARS

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Background: Return-to-play (RTP) criteria are increasingly utilized to ensure children who sustain an injury sufficiently rehabilitate for participation in sports. The Y-Balance Test (YBT) is a quantitative measure commonly used to assess neuromuscular control, limb symmetry, and composite strength in single-limb stance for informed RTP decision making. YBT reports have focused on validation for children aged 10-17 years. However, athletes aged 8-10 years are commonly treated for various sports-related injuries and may undergo similar functional performance tests.

Hypothesis/Purpose: To identify significant differences between YBT scores of 8-10 and 11- to 18-year-old athletes as an indicator of YBT validity in 8- to 10-year-olds recovering from a lower extremity injury.

Methods: A retrospective review was conducted of patients who presented for a lower extremity injury and completed functional performance testing for RTP decision-making from December 2015 to May 2021. Three balance conditions were tested bilaterally in the anterior, posteromedial, and posterolateral directions. Normalized component scores for each condition were calculated by dividing the raw YBT metric (reach distance) by leg length and multiplying by 100. In addition, a composite was computed per leg by averaging the three normalized component scores, and side-to-side differences (Δ) were calculated for each score (components and composite). Computed mean and sample standard deviation of the 12 YBT metrics described cohorts of 8-10, 11-12, 13-14, and 15- to 18-year-old athletes (Table 1). For each YBT metric, a Kruskal-Wallis ANOVA was performed to illustrate potential significance between age cohorts, and Games-Howell testing specified significance between age cohort pairings ($\alpha < 0.05$).

Results: 858 patients (354 males, 14.43 ± 2.28 years) comprised the retrospective cohort for analysis. Overall, significant differences in YBT metrics between age cohorts existed between the youngest (Y: 8-10) and oldest (O: 15-18) age cohorts for 5 YBT metrics: left anterior (Y: 73.77 ± 6.97 , O: 68.43 ± 9.87 , $p < 0.01$), left posteromedial (Y: 113.50 ± 15.34 , O: 112.87 ± 12.03 , $p = 0.03$), left composite (Y: 100.00 ± 8.84 , O: 97.00 ± 10.57 , $p = 0.01$), right composite (Y: 99.70 ± 7.39 , O: 96.90 ± 10.21 , $p = 0.04$), and Δ anterior (Y: 2.36 ± 2.09 , O: 3.23 ± 3.71 , $p = 0.04$; Table 1).

Conclusion: As YBT scores gradually increase with younger age within the validated age groups, patients aged 8-10 years demonstrate a similar trend despite lack of inclusion in existing validation studies. However, additional research may be needed to validate the YBT in younger pediatric patients.

Tables/Figures:

Table 1. Mean \pm Standard Deviation and Significance of 12 YBT Metrics by Age Cohort

Descriptive Statistics (Mean \pm SD)					
Y-Balance Metric	8 to 10 (54)	11 to 12 (119)	13 to 14 (237)	15 to 18 (448)	ANOVA <i>p</i> -value
Left Anterior	73.77 \pm 6.97	71.05 \pm 14.90	71.03 \pm 13.84	68.43 \pm 9.87	<0.01*
Right Anterior	72.91 \pm 7.18	71.78 \pm 16.75	71.49 \pm 14.59	68.69 \pm 9.29	0.46
Left Posteromedial	113.50 \pm 15.34	115.03 \pm 28.08	112.76 \pm 22.05	112.87 \pm 12.03	0.01*
Right Posteromedial	114.91 \pm 15.31	114.95 \pm 26.75	112.85 \pm 23.53	112.58 \pm 11.47	0.06
Left Posterolateral	112.64 \pm 9.85	111.93 \pm 26.61	110.07 \pm 22.72	109.42 \pm 13.07	0.11
Right Posterolateral	110.60 \pm 10.41	111.33 \pm 26.14	109.76 \pm 23.41	109.15 \pm 13.21	0.05
Left Composite	100.00 \pm 8.84	99.60 \pm 23.28	97.08 \pm 19.16	97.00 \pm 10.57	0.01*
Right Composite	99.70 \pm 7.39	99.64 \pm 23.29	98.16 \pm 20.00	96.90 \pm 10.21	0.04*
Δ Anterior	2.36 \pm 2.09	3.03 \pm 2.39	2.61 \pm 2.70	3.23 \pm 3.71	0.04*
Δ Posterolateral	3.18 \pm 2.91	3.15 \pm 2.79	3.07 \pm 2.81	3.53 \pm 3.47	0.48
Δ Posteromedial	3.88 \pm 9.37	3.15 \pm 2.83	3.67 \pm 7.00	3.19 \pm 3.03	0.69
Δ Composite	2.92 \pm 4.01	2.99 \pm 3.27	2.85 \pm 3.55	2.87 \pm 2.83	0.92

Note: Significant ANOVA results noted in bold with an asterisk (). Post-hoc analyses revealed between-group differences existed between the 8-10 and 15-18 year-old groups.*