Does maturation influence functional performance in youth males?

Regan Standing and Peter S. Maulder

Centre for Sport Science and Human Performance

Wintec, Hamilton, New Zealand

Background

Understanding the role biological maturity has on athletic motor skills may have greater implications for age based sporting selection.

- During adolescence peak height velocity (PHV) refers to the maximum rate of vertical growth and provides an indication of biological maturity.
- Physiological adaptations that occur during this period can have varying implications on motor skill acquisition and functional performance (1).
- Although chronological age is often utilized for sports team selection, biological maturation and therefore individual motor skills can differ dramatically between individuals of a similar age.
- With rapid physical changes and a loss of neuromuscular control during stages of biological maturation, the risk of muscular and/or structural injury is increased (2).
- The purpose of this study was to identify the influence maturation has on functional performance in youth males.

Methods

- A cross sectional sample of 97 youth males (13.2 to 15.7 years old with a maturity offset of -1.0 to 2.6 years) were allocated into maturation groups which were assessed using non-invasive predictive methods (3).
- Maturation offset was < -0.49(pre), -0.50 to +0.49(circa) & > +0.5(post) (1).
- Participants performed three maximal 20m sprints (2mins rest between), with 5m, 10m and 20m times recorded.
- Unilateral horizontal jump performance was obtained for both left and right legs via three maximal jumps for distance from each leg (alternating legs each trial), with 90secs rest between attempts. Measurements were taken from the rear-most heel on landing.
- A 10s bilateral tuck jump (TJ) assessment was performed and qualitatively marked against a modified rubric (4) .
- A one way ANOVA with Bonferroni post hoc test was utilized to assess between and within group differences.
- Pearson's correlations between maturity offset and performance variables were also calculated.

Findings

- Anthropometric data revealed significant differences ($p<0.05$) in all measured variables between maturation groups (see Table 1).
- Significant group differences ($p<0.01$) revealed increased maturation status positively influenced speed performances (ES = 0.64 to 1.03) but not jump performances.
- Post groups were significantly ($p<0.05$) faster over all distances in comparison to the circa group. Circa groups were not significantly faster than the pre group over any distance.
- TJ scores identified no significant differences in pre (12.9 ± 2.0), circa (12.5 ± 2.6) or post (12.3 ± 3.3) group means.
- Associations between speed performances and horizontal jump performances were large to very large (r = -0.67 to -0.74).

Table 1: Anthropometric comparisons between maturation groups

Group	Height (cm) ± SD	Seated Height (cm) ± SD	Weight (kg) ± SD
Pre (N = 13)	157.6 ± 7	81.3 ± 3.8	46.9 ± 4.4
Circa (N = 36)	163.6 ± 5.4*	84.1 ± 2.2*	54.0 ± 8.4*
Post (N = 48)	172.7 ± 5.9*#	90.6 ± 3.4*#	64.2 ± 9.3*#

Note: * Significant difference ($p<0.05$) to Pre,
Significant difference ($p<0.05$) to Circa.

Sprints

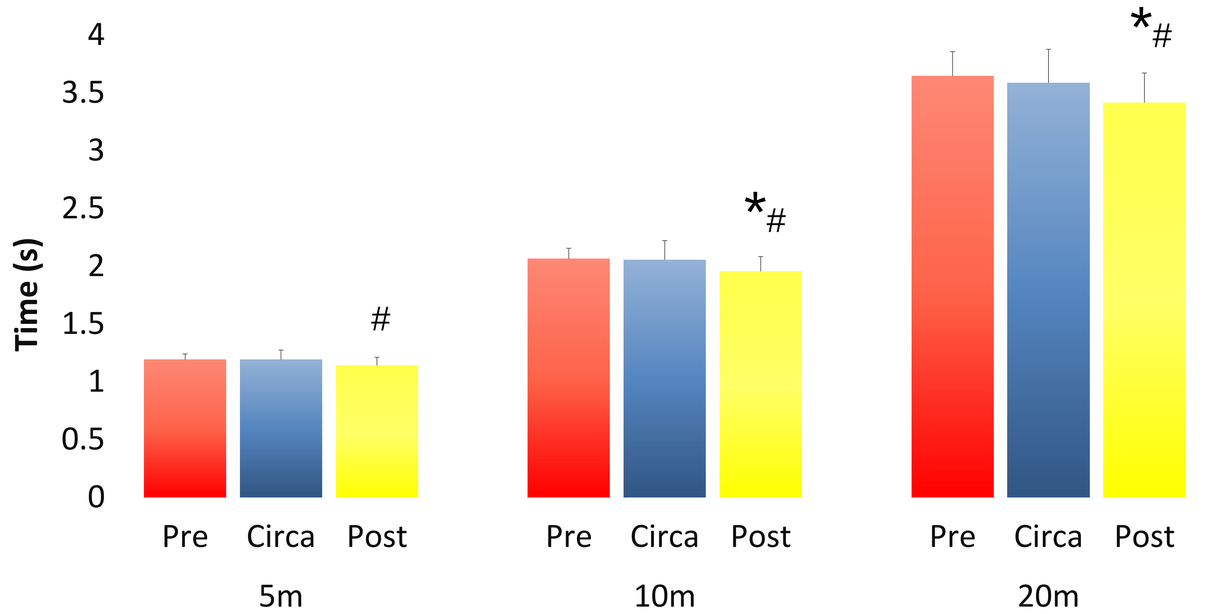

Figure 1: Comparison of 5m, 10m and 20m sprint times between maturation groups
Note: * Significant difference ($p<0.05$) to Pre,
Significant difference ($p<0.05$) to Circa.

Horizontal jumps

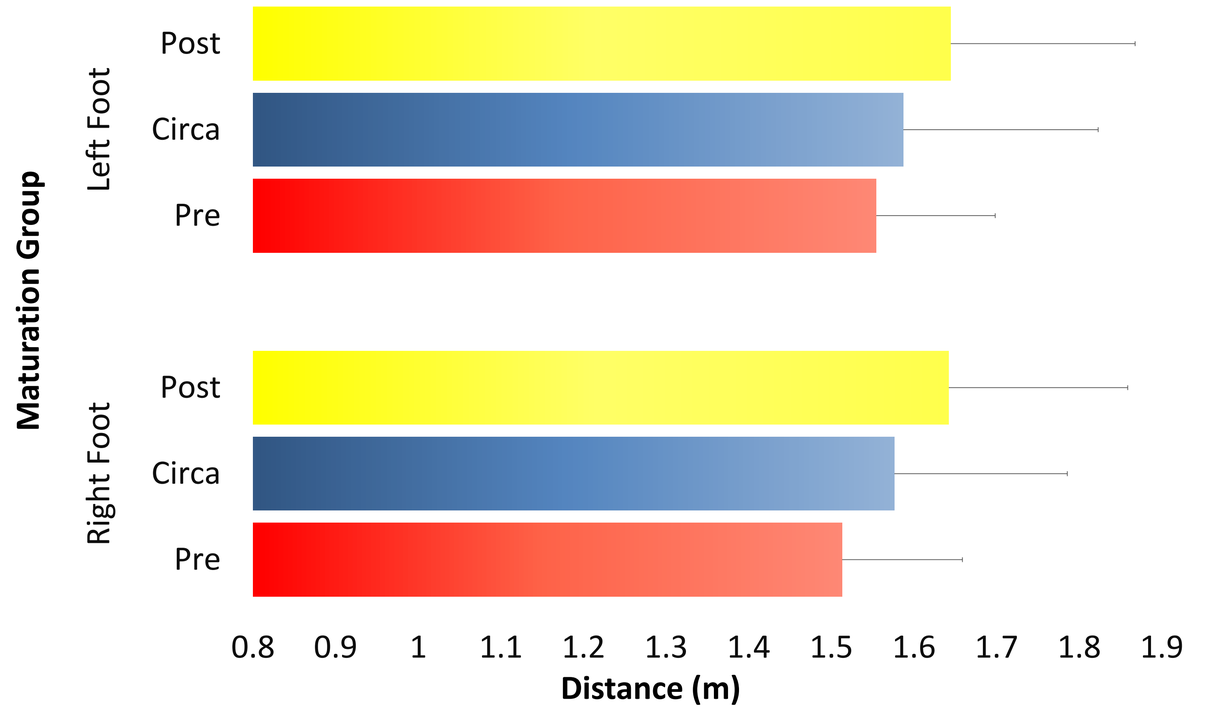

Figure 2: Unilateral horizontal jump performance

Practical Implications

- Physiological improvements in strength and power post PHV will likely have positive implications on force application and technical efficiency within sprint events (5).
- Interactions between step length, step frequency and contact time are likely effected by changes in limb length and mass as biological age increases, which may explain the lack of differences seen between pre and circa sprint times (1,5).
- Despite sprint and horizontal jump performance correlations similar to those found in literature (6), horizontal jump performance did not display significant improvements with increased maturation
- The TJ assessment revealed no significant changes in injury risk with maturation, despite significant increases in anthropometric data (4).

Future Research

- Investigations into the relationships between step length, step frequency and contact time between maturation groups.
- Intervention studies utilising neuromuscular training to decrease the risk of injury throughout the PHV period.
- Intervention strategies aiming to identify what stage of maturation fundamental movements are best developed.

References

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