

Humeral Morphology, and Physical Maturity of Youth Baseball Pitchers

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Background: In 2010, Little League Baseball mandated new regulations for game pitch counts and pitching rest days by age group in an effort to decrease the risk of injury. Previous research has suggested the extreme mechanical forces of throwing may induce soft tissue and bony changes in the dominant arm of baseball pitchers. However, physical maturity may better represent changes in the adolescent pitcher and provide a more exact method of controlling exposure to underdeveloped tissues and be a more effective method of reducing injury.

Purpose: The purpose of this study was to compare the influence of age and physical maturity on humeral morphology in youth pitchers.

Design and Setting: Prospective cohort

Subjects: Ten healthy youth (8-11 y.o.) baseball pitchers

Methods: Athlete height, weight, humeral growth plate, and humeral torsion were measured during the preseason for little league baseball. Humeral torsion was assessed via indirect ultrasonographic techniques as previously described. Humeral torsion difference was calculated by subtracting the mean dominant shoulder humeral torsion value from the mean non-dominant shoulder humeral torsion value. The humeral growth plate was assessed via indirect ultrasonographic techniques and measured utilizing Image J (NIH analysis software). Height and weight were measured utilizing a standard upright scale. Parents self reported their adult height. Physical maturity was calculated by methods validated by Malina et al. (2007) using athlete height and weight as well as self reported parental height measures. Bivariate correlations were performed to determine the relationship between humeral retro torsion, growth plate area and length, age, and physical maturity.

Results: Age and physical maturity were not correlated in our sample ($p=0.43$; $r = -0.064$). Dominant (D) humeral torsion was correlated with physical maturity ($r=0.77$; $p=0.008$) but not with age ($p=0.13$; $r=0.37$). Youth athletes that were more physically mature tended to display greater differences in retrotorsion between the D and non dominant (ND) arms ($p=0.01$). The D growth plate area demonstrated a trend toward significance when correlated with predicted height in inches ($p=0.06$; $r = 0.55$).

Conclusions: This pilot study demonstrates that our youth athletes' D humeral morphology was correlated with physical rather than chronological age. The retrotorsion difference between D and ND arms was greater in our youth athletes who were more physically mature but was not related to chronological age.

Clinical Relevance: Previous studies have documented that the skeleton is most responsive to exercise in the time immediately preceding puberty. Recommendation for exposure guidelines based on physical maturity rather than chronological age may help ensure safe participation.