順天堂大学大学院スポーツ健康科学研究科 和文抄録
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一高校女子硬式野球競技者における投球障害の実態調査：上肢の構造と機能に着目して

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【目的】
一高校女子硬式野球部を対象に投球障害の実態を把握するとともに、投球時の疼痛の有無と上肢の構造および機能との関連を検討し、投球障害予防について考察すること。

【方法】
高校女子硬式野球部員28名（平均年齢16.1±0.9歳）を対象に、アンケート調査（投球時の疼痛の有無や痛みの程度、競技背景）および、体組成に加えて、上肢の構造の評価として上腕骨後捻角および腕尺関節裂隙距離、全身関節弛緩性テスト、機能の評価として肩・股関節の他動的可動域および肩関節内外旋筋力を調査した。調査時点における投球時の肩および肘関節疼痛の有無による比較、および疼痛の程度と各測定値の相関分析を実施した。

【結果】
投球時の肩・肘関節疼痛ありと回答した者は39.3%（11名）であった。競技歴1～2年の初期段階でも4名中3名に疼痛がみられた。疼痛ありは疼痛なしと比較し、投球側の腕尺関節裂隙距離が有意に短く（3.2±0.5 mm vs. 3.9±0.9 mm, p=0.027）、肩関節内外旋筋力比（外旋/内旋）は有意に高値を示した（85.2±23.6% vs. 67.5±17.9%, p=0.033）。部位別では、肩関節疼痛ありで腕尺関節裂隙距離が有意に短く、肘関節疼痛ありで肩関節内外旋筋力比が有意に高かった。また、1週間の平均投球数と腕尺関節裂隙距離に負の相関（r=−0.423）、疼痛の程度と肩関節内外旋筋力比に正の相関（r=0.480）がみられた。

【結論】
一高校女子硬式野球部員の28名中11名（39.3%）に投球時の肩・肘関節痛がみられた。また、疼痛ありの者は疼痛なしの者と比較して、投球側の腕尺関節裂隙距離が短く、肩関節内外旋筋力比が高値を示し、構造と機能に差がみられた。本研究から女子競技者における投球障害予防には、肩関節内外旋筋力のバランス改善と競技経験年数や身体特性を考慮した段階的な負荷管理の重要性が示唆された。

Juntendo University, Graduate School of Health and Sports Science 英文抄録（Abstract）
2025 Master's Thesis

Survey of throwing injuries in female high-school hardball baseball players: particularly addressing upper limb structure and function

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[Purpose]
This study was conducted to clarify the actual status of throwing injuries among female high-school hardball baseball players, to examine the relation between the presence of pain during throwing and the structure and function of the upper limbs, and to elucidate strategies for preventing throwing injuries.

[Methods]
To 28 high school female hardball baseball players (mean age 16.1 ± 0.9 years) we administered a questionnaire survey of pain presence and intensity during throwing and competitive background. Additionally, we assessed body composition and the following parameters: for upper limb structure, we assessed humeral retroversion and ulnar–humeral joint space width; for general joint laxity, we applied the General Joint Laxity (GJL) test; and for functional evaluation, we examined the passive range of motion (ROM) of the shoulder and hip joints, as well as shoulder internal and external rotation muscle strength. Comparisons were made based on the presence or absence of shoulder and elbow pain during throwing at the time of the survey. Correlation analyses were conducted between pain intensity and each measured value.

[Results]
Eleven participants (39.3%) reported shoulder or elbow pain during throwing. It is noteworthy that three out of four players reported pain, even in the early stages of their careers (1–2 years of experience). Compared to the painless group, the pain group was found to have a significantly narrower joint space width in the ulnar–humeral joint of the throwing arm (3.2 ± 0.5 mm vs. 3.9 ± 0.9 mm, $p=0.027$) and a significantly higher shoulder external/internal rotation strength ratio (85.2 ± 23.6% vs. 67.5 ± 17.9%, $p=0.033$). By site, shoulder pain was significantly associated with a narrower ulnar–humeral joint space width, whereas elbow pain was associated with a higher shoulder rotation strength ratio. Furthermore, negative correlation was found between the average weekly pitch count and ulnar–humeral joint space width ($r=-0.423$). Positive correlation was found between pain intensity and the shoulder rotation strength ratio ($r=0.480$).

[Conclusion]
Shoulder or elbow pain during throwing was observed in 11 out of 28 high school female hardball baseball players (39.3%). Significant differences in structure and function were identified; specifically, players with pain exhibited a narrower ulnar–humeral joint space width on the throwing side and a higher shoulder external/internal rotation strength ratio than players without pain. These findings suggest that for preventing throwing injuries in female athletes, it is crucially important to improve the balance of shoulder internal and external rotation strength and to implement gradual workload management that incorporates consideration of years of competitive experience and individual physical characteristics.