THE IMPACT OF THROWING VOLUME ON SHOULDER INTERNAL AND EXTERNAL ROTATION FORCE IN DIVISION III PITCHERS DURING SPRING TRAINING

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INTRODUCTION

- Shoulder health and integrity is paramount for maintaining performance and reducing injury in baseball pitchers.
- Due to the unique demands of pitching, it has been found that baseball players have the greatest percentage of injuries across all sports, with the majority occurring within the shoulder due to the repeated microtrauma of soft tissue due to the strain of throwing[1].
- There currently are limited studies measuring the impact of throwing volume on these athletes.
- Most injuries have been found to be during the acceleration phase in late cocking (external rotation of the shoulder) and during the deceleration phase after ball release (internal rotation of the shoulder)[2].
- Understanding maximal voluntary isometric contractions (MVIC) of shoulder external rotation (ER) and internal rotation (IR) may allow coaches and researchers to monitor shoulder health and readiness to compete.

METHODS

- 22 DIII baseball pitchers from the University of Mary Hardin-Baylor were recruited for this study.
- 20 of the 22 did **not** have current upper extremity injuries.
- Data analysis is based on **9** participants who had **full compliance** throughout the entire study.
- Maximal voluntary contractions were measured Monday, Tuesday, Thursday during the seven weeks of spring training using the VALD ForceFrame[3].
- Peak rotational force was recorded as the highest force output of ER and IR respectively each day.
- Daily predicted throwing volume was calculated by multiplying throw count by throw distance by given intensity from the pitching coach.
- Results were analyzed in SPSS using Pearson Product Moment Correlation ($p < 0.05$).

RESULTS

- N = 9; 20.4 ± 1.26 yrs; 185.21 ± 6.35 cm; 85.18 ± 8.42 kg
- Peak external rotation force (176.89 ± 33.74 N)
- Peak internal rotation force (208.95 ± 38.75 N)
- Throwing volume (11075.98 ± 11539.47)
- There was no significant correlation between ER force and previous day throwing volume.
  - (r = -0.07, p = 0.83)
- There was no significant correlation between IR force and previous day throwing volume.
  - (r = 0.017, p = 0.33)

REFERENCES

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IN DIVISION III BASEBALL PITCHERS, PREVIOUS DAY THROWING VOLUME IS NOT A GOOD PREDICTOR OF SHOULDER FATIGUE.

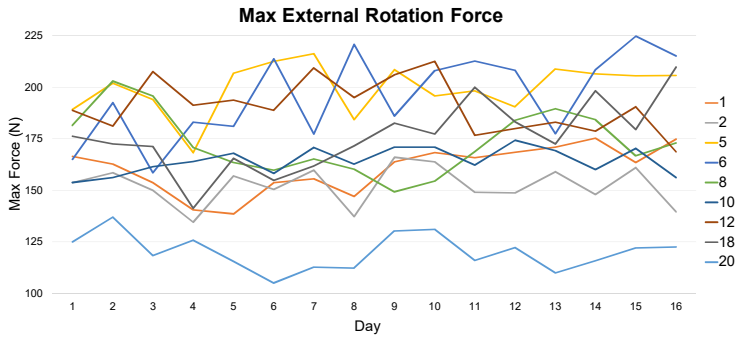

Figure 1: ER values for all nine participants

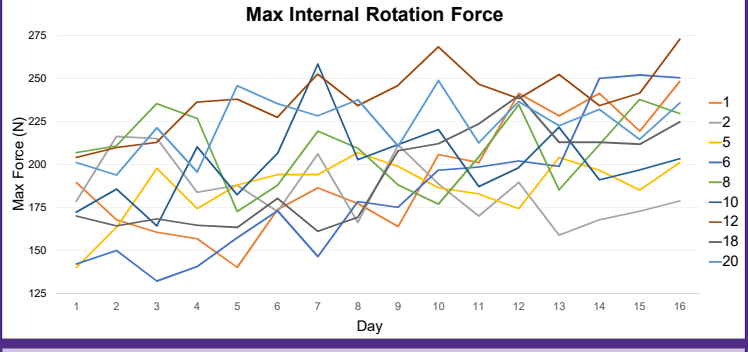

Figure 2: IR values for all nine participants

RESULTS

Predicted Throwing Volume									
	1	2	5	6	8	10	12	18	20
8-Jan	0	0	0	0	0	0	0	0	0
9-Jan	0	0	0	0	0	0	0	0	0
11-Jan	0	0	0	0	0	0	0	0	0
22-Jan	4800	14040	14100	13860	4800	25470	4800	9600	3525
25-Jan	36900	3525	13860	3825	36900	2925	36900	30780	13860
29-Jan	2925	36900	4800	36900	2925	25740	2925	2625	4800
30-Jan	13860	25740	2925	25740	13860	3825	13860	17100	2925
1-Feb	25740	4800	36900	4800	25740	2925	25740	3525	36900
5-Feb	13860	25740	2925	25740	13860	3825	13860	17100	2925
6-Feb	36900	3825	13860	3825	36900	14400	36900	25470	13860
8-Feb	25740	2625	25740	2625	3825	9600	3825	4800	25740
12-Feb	9600	30780	2625	30780	9600	3525	9600	14040	2625
13-Feb	14040	2625	9600	2625	14040	4800	14040	30780	9600
15-Feb	30780	24900	31800	25470	30780	17100	30780	9600	31800
19-Feb	9600	0	2625	0	9600	0	9600	0	2625
20-Feb	14040	6360	9600	4800	14040	4800	14040	2625	14040

Table 1: Previous day predicted throwing volume

CONCLUSIONS

- Pitching presents a unique set of microtrauma throughout the shoulder girdle.
- Although there was no correlation between shoulder rotational forces and daily throwing volume, a more robust approach may be necessary to better understand shoulder fatigue.
- Further research should focus on individual aspects of recovery as well as training tenure to better assess shoulder adaptations to training.

PRACTICAL APPLICATION

- Previous day training load alone is not a good predictor of shoulder ER and IR force output in DIII collegiate pitchers.
- A more comprehensive model is needed to better assess individual differences in recovery such as weekly training volume, game pitches RPE, and mood states.
- Overall, understanding how athletes respond to a widely prescribed training load may allow for more individualized programming to occur.

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