



Scapular Upward Rotation and Acromiohumeral Interval Changes in Collegiate Baseball Players During a Weighted and Un-Weighted Scaption Exercise



Melissa D Thompson, Dennis Landin, Phillip A Page:
Louisiana State University, Baton Rouge, LA

BACKGROUND

Decreases in scapular upward rotation (SUR) is believed to be one of the factors related to subacromial impingement and narrowing of the acromiohumeral interval (AHI) during arm elevation.²⁻⁴ Most dynamic analyses of SUR have used surface electrodes which do not allow for concurrent analysis of AHI. Furthermore, scaption exercises are often prescribed in shoulder rehabilitations, yet little is known about their effect on glenohumeral kinematics. The recent advances in the image quality of digital fluoroscopic videos (DFV) makes it an attractive modality for further study of shoulder kinematics during dynamic motions.⁵

OBJECTIVE

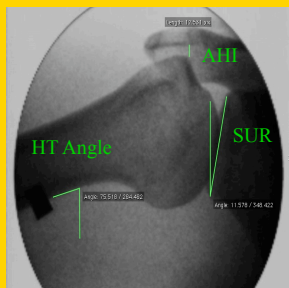
To determine if differences exist in SUR and AHI during a weighted and un-weighted scaption exercise in healthy baseball athletes.

PARTICIPANTS

Twelve division one collegiate baseball players (age = 20.1 ± 1.1 years, mass = 85.3 ± 6.8 kg, height = 179.1 ± 6.8 cm) with no history of surgery or current injury involving their dominant arm.

METHODS

- 3 trials of dynamic un-weighted scaption (seated 0° – 90°)
- 3 trials of dynamic weighted scaption (seated 0° – 90°)
 - Normalized load, based on limb anthropometrics¹ (range: 2.6 - 4.4 kg)
- Obtained DFV on last two trials for each condition with Orthoscan HD Mini C-arm. Videos analyzed frame by frame using OsiriX imaging software.



- Excellent test-retest reliability in pilot testing. Average ICC (3,k) weighted=.945; un-weighted=.917
- Measurement verification by musculoskeletal radiologist in 2 subjects.

DATA ANALYSIS

- Measured SUR and %AHI at four different humeral-thoracic (HT) angles (30°, 45°, 60°, 75°) during a weighted and un-weighted scaption exercise.
- Statistical analysis: Paired t tests

%AHI

- AHI measured as the smallest vertical distance between the dense cortical line of the acromion and the most superior aspect of the humeral head or the greater tubercle.
- %AHI = normalized AHI, expressed as the percentage of space at each HT angle in reference to the AHI with arm at side for each subject.

SUR

- Measured as the angle between the inferior and superior glenoid tubercles and a vertical reference line.

RESULTS

HT Angle	Condition	% AHI	SUR	Correlations
30° n = 12	Un-Weighted	48.6% ± 18.1%	-9.2° ± 9.5°	r = .712, p=.009**
	Weighted	55.4% ± 20.1%	-8.5° ± 8.7°	r = .880, p=.001**
45° n = 12	Un-Weighted	34.4% ± 11.1%	-5.3° ± 8.5°	r = .308, p=.330
	Weighted	33.8% ± 13.2%	-4.4° ± 8.5°	r = .872, p=.001**
60° n = 12	Un-Weighted	27.8% ± 10.7%	-2.0° ± 8.2°	r = -.426, p=.168
	Weighted	24.0% ± 9.1%	0.3° ± 8.1°	r = .850, p=.002**
75° n = 11	Un-Weighted	33.1% ± 10.1%	1.7° ± 8.6°	r = -.574, p=.065
	Weighted	24.6% ± 11.1% ^a	5.9° ± 9.4° ^b	r = .809, p=.008**

^a weighted %AHI lower than un-weighted (P < .05)

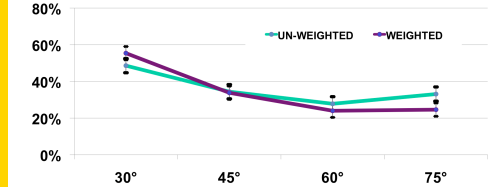
^b weighted SUR lower than un-weighted (P < .05)

** correlation between %AHI and SUR is significant (P < 0.01)

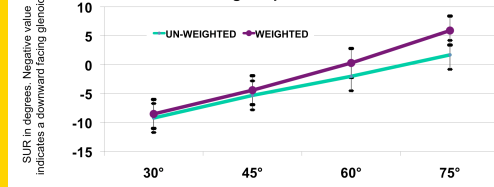
DISCUSSION

The size of the subacromial space decreased from 0°-60° during the dynamic arm motion in both the weighted and un-weighted scaption. On average, subjects displayed less than 25% of their available AHI at 60° and 75°. The addition of the weight resulted in significantly greater reductions in %AHI at 75°. Strong relationships between %AHI and SUR with the addition of the load suggest that SUR is an important factor in AHI during dynamic arm motions. Averages of the correlations indicate that %AHI and SUR share 73% common variance during weighted scaption. Further investigation of these variables should take place in injured subjects and beyond 75° during dynamic arm motions.

%AHI at each Humeral-Thoracic Angle During Scaption Exercise



Scapular Position at each Humeral-Thoracic Angle During Scaption Exercise



CONCLUSIONS

Greater SUR is associated with better maintenance of the subacromial space during weighted scaption. However, the addition of the weight during the scaption exercise resulted in further reduction of the AHI during arm elevation despite increases in SUR in healthy subjects. More research is necessary to determine how differences in glenohumeral kinematics during a weighted scaption exercise may affect exercise prescription.

REFERENCES

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